COMPARATIVE ANALYSIS OF AXILLARY FLAP AND ANGLED CONVENTIONAL TECHNIQUE DURING TELESCOPIC FRONTAL SINUSOTOMY

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I hereby declare that the thesis entitled "**COMPARATIVE ANALYSIS OF AXILLARY FLAP AND ANGLED CONVENTIONAL TECHNIQUE DURING TELESCOPIC FRONTAL SINUSOTOMY**" submitted towards partial fulfillment of the requirements for the award of **MS in Otorhinolaryngology (ENT)** degree to BFUHS is a compilation of original work carried out by me under the supervision of **Dr. Manish Munjal,** Professor & Head, Department of ENT, **Dr. Hitant Vohra**, Professor & Head, Department of Anatomy, **Dr. Rohit Verma,** Professor, Department of ENT and **Dr. Sanjeev Puri,** Assistant Professor, Department of ENT. No part of this thesis has formed the basis for the award of any degree previously.

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Dedicated

to

my Family

&

Teachers

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COMMIT TO THE LORD WHATEVER YOU DO, AND HE WILL ESTABLISH YOUR PLANS. Successful completion of a task is often less due to individual talent than to the fact that the person has been blessed by the 'GOD ALMIGHTY'

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Dr ShivamTalwar

ABBREVIATIONS

AEA	Anterior ethmoidal artery
ANS	Anterior nasal spine
ARS	Acute rhino sinusitis
CSF	Cerebrospinal fluid
CT	Computed tomography
EMLP	Endoscopic modified lothrop
ESS	Endoscopic sinus surgery
ET	Ethmoturbinal
FO	Frontal ostium
MRI	Magnetic Resonance imaging
MT	Middle turbinate
MTL	Middle turbinate lateralization
NFA	Nasofrontal approach
OMC	Osteomeatal unit
OMU	Osteomeatal unit
OPF	Osteoplastic flap approach
OS	Ostium
SSS	Superior sagittal sinus

ABSTRACT

INTRODUCTION*:* Frontal Sinus can be approached by conventional endoscopic frontal sinusotomy, frontal sinus osteoplastic approach, trephine+ endoscopic, intranasal modified lothtrop and axillary flap approach. In this study we will compare axillary flap with conventional endoscopic technique of frontal sinosotomy

AIMS AND OBJECTIVES: 1) To assess long term status of frontal recess in period of 1 ½ year in the two techniques that is axillary flap and the conventional angled endoscopic technique in terms of i) Patency of frontal recess and frontal sinus ostium ii) Untoward and unexpected sequelae in frontal recess iii) any symptomatology a) frontal headache b) epistaxis c) rhinnorhoea. 2. To study the anatomy of the frontal recess in ten cadaveric specimens.

MATERIALS AND METHODS*:* In this Study 60 cases operated with axillary flap technique will be compared with 60 cases with conventional angled technique during telescopic frontal sinusotomy

RESULTS: Follow-up evaluation at 6th month, the size of frontal sinus ostium operated by axillary flap is larger as compared to conventional. The mean value of ostia after axillary approach was 4.77 mm and via conventional was 1.80 mm At 6^{th} month, equal number of cases with edema. In 6^{th} month, more polypi were noticed in sides operated by conventional as compared to by axillary. Follow up at 1st month, 3^{RD} month and 6-month neo-osteogenesis was not found in both the techniques. At 6^{th} month, more webbing was found in sides operated by axillary At 6^{th} month, residual symptoms like headache and nasal blockage in sides operated by axillary are less as compared to conventional. In cadaveric study, the frontal ostium lies was at a distance of 5.6-6cm in majority of specimens. Majority of cadavers had distance of about 2.1-2.5 cm from middle turbinate to frontal ostium. Majority of cadavers had size of ostium between 3.6-4 mm Agger nasi cell was present in 8 cadaveric specimen.

Conclusion: The frontal recess patency was retained in the axillary technique even after 6 months. There was no effect on the incidence of allergic effect of air currents in the axillary flap technique in the form of more polypii or edema though the frontal recess is more exposed w.r.t conventional. The post operative office debridement of frontal sinus in the axillary flap is more thorough and meticulous as compared to conventional

KEYWORDS: Axillary Flap, Angled Conventional Telescopic Technique, Frontal Sinusotomy.

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INTRODUCTION

The existence of the paranasal sinuses was first documented by Galen in 691 AD[1] and the individual frontal, maxillary and sphenoid sinuses by Versalius[1] in early the 16th century.

Wisdom[1] mentioned that the frontal sinus is usually a paired structure. The sinus drainage was first observed by Schaffer[2] in 1890.

The sinus, one on either side, lies deep to the supraciliary ridges; between the outer and inner tables of the frontal bone. They are generally asymmetrical; with the intervening septum deviating from the median plane. This sinus is usually larger in men as compared to women. Both the frontal sinuses do not develop in 4% of the population. Som Pm, Curtin HD.Mosby 1996, Schaffer JP 1920.[3]

With the evolvement of new techniques such as computed tomography, magnetic resonance imaging, nasal endoscopy and endoscopic nasal intervention surgery, a great deal of progress has been made in this regard.

The frontal sinus is bounded by forehead superiorly, anterior cranial fossa posteriorly and the orbit inferiorly. The sinus drains into the middle meatus inferiorly through a narrow channel traversing the ethmoidal air cells. Medical and surgical intervention is undertaken in anterior wall osteomyelitis, posterior wall erosion with intracranial involvement; in mucocele and ipsilateral proptosis.

Imaging of the paranasal sinuses is integral to gather information that is necessary for clinical management. Medical management remains the mainstay of treatment for most forms of frontal sinusitis.

The anatomical location and venous drainage of the frontal sinus can cause infections of the frontal sinus to spread and become life threatening.[4]

The concept of the frontal recess as the frontal sinus drainage pathway was given by Killian [5] in 1896.

Surgical management of frontal sinus disease was described in the 19th century.

Frontal sinus mucocele was first described by Ambroise Pare[6] in 1564.

Controversy exists whether intranasal or external approach is to be taken of the frontal sinus management.[4]

Earlier the surgical procedures were radical involving the removal of part or the entire anterior sinus wall.

Lettre[7] advocated trephining the frontal sinus in 1704. Ogston[8] 1884 first operated on the frontal sinus through the forehead.

Tange[1] 1991 traced the origin of paranasal sinus surgery to ancient Egypt where instruments were used to remove the brain tissue through the nose as part of the mummification process.

Zaufal[9] 1880 gave the concept of nasal endoscopy. He utilized an endoscope for the examination of eustachian tube orifices through the nose. The contemporary endoscope was designed by Hirchmann[10] in 1903.

Even with the advent of endoscopic sinus instrumentation, the frontal sinus remains the most challenging paranasal sinus to treat. This is attributed to the technical challenges in the surgical exposure of the entire sinus. Instrumentation involves high degree of dextrity because of the limited access available for surgery.[11]

Ventilation and mucociliary clearance of the frontal sinuses require a wide and patent frontal recess as well as ostium. The approach to frontal sinus can be by conventional, external and internal or be purely internal endoscopic [12] Navigation even facilitates frontal sinus access

Messerklinger [9] developed the endoscopic technique with the aim to rejuvenate the diseased sinuses while preserving healthy mucosa, with a minimally invasive modality. Whilst the technique has previously been advocated, other endoscopic techniques have gained recent popularity, namely the modified Lothrop ; that is frontal sinus drill out and the balloon sinuplasty. Combined intranasal and external approaches to the frontal sinus are other available options, i.e. trephination and osteoplastic flaps with or without sinus obliteration.[13]

The axillary flap technique as advocated by PJ Wormald 2002[14] is a recent modality where frontal recess is approached with 0 degree rather than the angled telescopes.

The exposure obtained intraoperatively and the long-term patency of frontal recess in either technique will be compared in this Study 60 cases operated with axillary flap technique will be compared with 60 cases with conventional angled technique during telescopic frontal sinusotomy.

AIMS AND OBJECTIVES

Part I. To assess long term status of frontal recess in a period of 1 ½ year in the two endoscopic techniques that is axillary flap and the conventional angled technique, in terms of

a) Patency of frontal recess and frontal sinus ostium
b) Untoward and unexpected sequelae in frontal recess
c) any untoward symptomatology

Part II. To study the anatomy of the frontal recess in ten cadaveric specimens.

REVIEW OF LITERATURE

Schaffer1916 coined the term “frontal sinus” [15]. Computed tomographic studies and nasal endoscopy of frontal recess has facilitated diagnosis of frontal sinus disease with a successful surgical intervention.

Frontal sinus has been reviewed from the following aspects:

i. Embryological
ii. Anatomical
iii. Physiological
iv. Pathophysiological
v. Radiological
vi. Surgical
vii. Surgical complication and outcome of intervention
viii. Literature on frontal sinusotomy (clinical and cadaveric)

1) Embryological aspects:

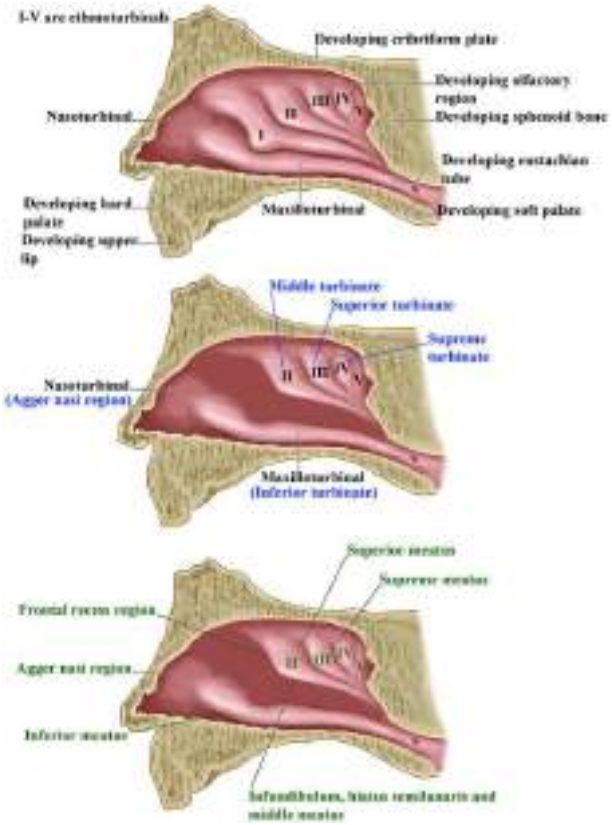
Kasper 1936 recorded the origin of frontal sinus from pits or furrows originating within frontal recess [16]. Development of head and neck along with face, nose and paranasal sinuses takes place simultaneously. At the end of the 4th week, embryo gets its first identifiable head and face with an orifice in its middle, known as the stomodeum. The stomodeum is limited superiorly by the presence of frontonasal eminence and inferiorly by the mandibular arch. The frontonasal process forms the nasal cavity, primitive choana and nasal septum. The oronasal membrane is fully formed by the end of 5th week of development. It gives rise to the floor of the nose (palate develops from this membrane). At about 25 – 28 weeks of gestation, three medially directed projections arise from the lateral wall of the nose. This serves as the beginning of the development of paranasal sinuses. The medial projections arising from the lateral wall of the nose forms the following structures:[17]

1. The anterior projection forms the agger nasi
2. The inferior (maxilla-turbinate) projection forms the inferior turbinate and maxillary sinus

3. The superior projection (ethmoido-turbinate) forms the superior turbinate, middle turbinate, ethmoidal air cells and their corresponding drainage channels. The middle meatus develops between the inferior and middle turbinate. The middle meatus invaginates laterally to form the embryonic infundibulum and uncinate process

Ethmoturbinal ridges(ET) - A series of five to six ridges first appear during 8th week of gestation, due to fusion and regression only three to four ridges persist.[17]

i. First ET Ridge – Ascending portion – Agger nasi Descending portion – Uncinate
ii. Second ET Ridge- middle turbinate
iii. Third ET Ridge – superior turbinate
iv. Fourth & Fifth – supreme turbinate
v. Maxillo-turbinal ridge – inferior turbinate
vi. 1st Primary furrow- between first & second ET
vii. Descending aspect – ethmoidal infundibulum, hiatus semilunaris, middle meatus.
viii. Ascending aspect – frontal recess
ix. 2nd primary furrow – superior meatus
x. 3rd primary furrow – supreme turbinate



The ethmoturbinal ridges[18]

There are four frontal pits or furrows.

First frontal pit – agger nasi cell

Second frontal pit – frontal sinus cell

Third and fourth frontal pit – other anterior ethmoid cell such as suprabullar cell, supraorbital cell.

Frontal sinus is absent at birth and develop at second year of birth from the anterior most ethmoidal cells which grow into frontal bone. The frontal sinus may develop as a direct continuation of embryonic infundibulum and frontal recess superiorly during the 16th week. It can also develop by upward migration of anterior ethmoidal air cells to penetrate the inferior aspect of the frontal bone between its outer and inner tables. Pneumatization of frontal bone is a very slow process. The frontal sinus infact remains as a small blind sac within the frontal bone till the child is about 2 years of age, then secondary pneumatization begins. From the age of 2 till the child becomes 9 years old secondary

pneumatization of frontal bone proceeds. When the child reaches the age of 9, the development of the frontal sinus has reached completion. Sometimes frontal sinus may be asymmetrical or aplastic as well.[17]

Frontal sinus drains in to middle meatus and nasal cavity by frontal recess. (Previously known as nasofrontal duct-tubular structure conducting fluids between frontal sinus and nasal cavity)now termed as frontal recess (Killian in 1898 coined the term frontal recess.)[16]

2) Anatomical aspects:

THE LATERAL NASAL WALL:

The anatomy of the lateral wall of the nasal cavity has three paired turbinates: superior, middle, and inferior. Occasionally, a fourth turbinate, the supreme turbinate, exists. The space between the turbinates along their lateral margin and the lateral walls of the nasal cavity is known as the meatus. The inferior turbinate is attached to the lateral wall of the nasal cavity, and only the nasolacrimal duct drains into the inferior meatus.Functionally, the middle meatus is important because the maxillary sinus, anterior two thirds of the ethmoid sinuses, and frontal sinus drain into it. Most anatomic variants occur in middle meatus and the turbinate region. The sphenoid sinuses and posterior third of the ethmoid drain into the superior meatus [19]

MAXILLARY SINUS:

The adult maxillary sinus is a pyramid which has a volume of approximately 15 ml [20]. The maxillary sinus is pyramidal in shape and is the largest of the paranasal sinus[20]. The anterior wall of the maxillary sinus is formed by the facial surface of the maxilla The posterior wall is formed by the infratemporal surface of the maxilla. It forms the anterior border of the pterygopalatine fossa The superior wall is formed by the fragile, triangular orbit floor, with the infraorbital groove running through it[20] The medial wall of the maxillary sinus separates the sinus from the nasal cavity. It is smooth on the sinus side and carries the inferior nasal conchae on the nasal side. The medial wall is rectangular in shape and

is slightly deficient at the maxillary hiatus. This opening is partially closed in an articulated skull by sections of the inferior turbinate, the uncinate process of the ethmoid bone, the perpendicular plate of the palatine bone, the lacrimal bone, and the overlying mucosa to form the ostium as well as anterior and posterior fontanelles. The ostium opens into the inferior part of the ethmoidal infundibulum, passing through the semilunar hiatus, then finally into the middle nasal meatus. The ostium is elliptical-shaped throughout prenatal development and located in the anterior third of the ethmoidal infundibulum. In adults, however, the ostium is located between the middle and posterior thirds of the ethmoidal infundibulum and tends to be positioned closer to the roof of the sinus than the floor. In some cases, the ostium is divided into two sections via a mucosal membrane[20].

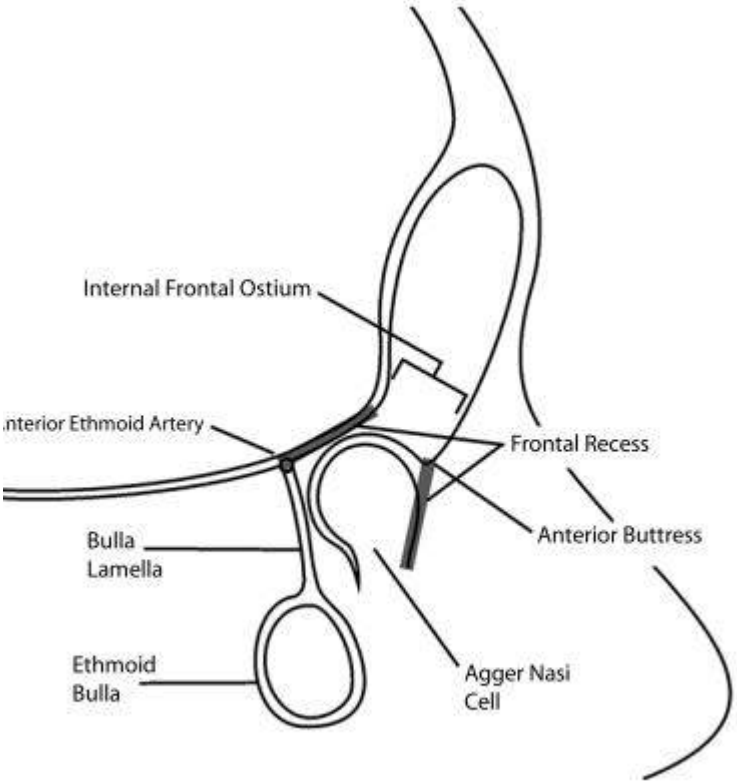
UNCINATE PROCESS:

The uncinate process is a superior extension of the lateral nasal wall (medial wall of the maxillary sinus). On computed tomography, the uncinate process can be seen attached inferiorly to the inferior turbinate with the free edge representing the posterior free margin. Anteriorly, the uncinate process may be attached to the lamina papyracea, the skull base or the middle turbinate. This variable superior attachment results in different clinical implications. Laterally this free edge delimits the infundibulum. Posterior to the uncinate process is the ethmoid bulla, usually the largest of the anterior ethmoid cells [20]

FRONTAL SINUS:

The frontal sinuses have an overall funnel shape, and their aeration varies from patient to patient and from side to side in individual patients, it is pyramidal in shape on transverse section described by Mosher et al1929[21]. Some sinuses are small and occupy only the diploic space of the medial frontal bone, while other sinuses can be large enough to extend through the floor of the entire anterior cranial fossa. In general, a central septation separates the left and right sides; however, often there may be several septations. The floor of the frontal sinus

slopes inferiorly toward the midline. Close to the midline, the primary ostium is located within a depression in the floor[21]



[22]

The frontal sinus

Bent et al. in 2001 defined frontal cells more specifically as belonging to one of four categories[18]

- Type I- Single frontal recess cell above agger nasi cell
- Type II- Tier of cells in frontal recess above agger nasi cell
- Type III- Single massive cell pneumatizing cephalad into frontal sinus
- Type IV- Single isolated cell within the frontal sinus

FRONTAL RECESS:

The frontal recess is an hourglass like narrowing between the frontal sinus and the anterior middle meatus through which the frontal sinus drains. It is not a tubular structure, as the term nasofrontal duct might imply, and therefore the term recess is preferred. The frontal recess usually drains into the middle meatus (62%) or into the ethmoid infundibilum (38%)[24]

ANTERIOR OSTIOMEATAL UNIT:

The anterior ostiomeatal unit includes the frontal sinus ostium, frontal recess, maxillary sinus ostium, infundibulum, and middle meatus. These channels provide communication between the ipsilateral frontal, anterior ethmoid, and maxillary sinuses. The gap between the ethmoid bulla and the free edge of the uncinate process defines the hiatus semilunaris. Medially, the hiatus semilunaris communicates with the middle meatus, the air space lateral to the middle turbinate. Laterally and inferiorly, the hiatus semilunaris communicates with the infundibulum, the air channel between the uncinate process (caudal border) and the inferomedial margin of the orbit (cranial border). The infundibulum serves as the primary drainage pathway from the maxillary sinus. The structure medial to the ethmoid bulla and the uncinate process is the middle turbinate. Anteriorly it attaches to the medial wall of the agger nasi cell and the superior edge of the uncinate process. Superiorly it adheres to the lateral edge of the cribriform plate. As it extends posteriorly, the middle turbinate emits a number of posterolaterally coursing bony structures[19]

FRONTAL RECESS ANATOMY

Stammberger 1995[25] mentioned that the frontal recess is superior continuation of ascending groove between first and second Ethmotubrbinates and frontal sinus originates from anterior pneumatization of frontal recess in frontal bone.

The anatomic variations of uncinate process were defined as Stammberger and Bolger[25]

1. Superior attachment of uncinate could be to

a. Type I—the uncinate process is inserted into the lamina papyracea,

b. Type II—the uncinate process extends superiorly to the roof of the ethmoid, that is the skull base,

c. Type III—the uncinate process is attached to the middle turbinate

2. Medially bent uncinate process
3. Laterally bent uncinate process
4. Hypertrophied uncinate process
5. Pneumatized uncinate process

Boundaries of frontal recess

The boundaries of the recess are:

- Laterally - Lamina papyracea and uncinate process
- Medially – Middle turbinate anteriorly and the posterior wall of Agger nasi cell (when present)
- Posteriorly- Anterior wall of Ethmoidal bulla. If ethmoidal bulla has not reached up to skull base, the frontal recess will then communicate with the suprabullar recess [25]

Supraorbital ethmoid air cells arise from pneumatization of orbital process of frontal bone

Van Aleya et al 1946 [26] noted that frontal recess enters middle meatus medial to ethmoid infundibulum either anterior (55% case) or superior in (30% cases) to the superior attachment of the uncinate process on the lateral nasal wall and frontal sinus directly drain into ethmoidal infundibulum(15% cases) or posterior to uncinate process.[26]

The frontal recess[27]

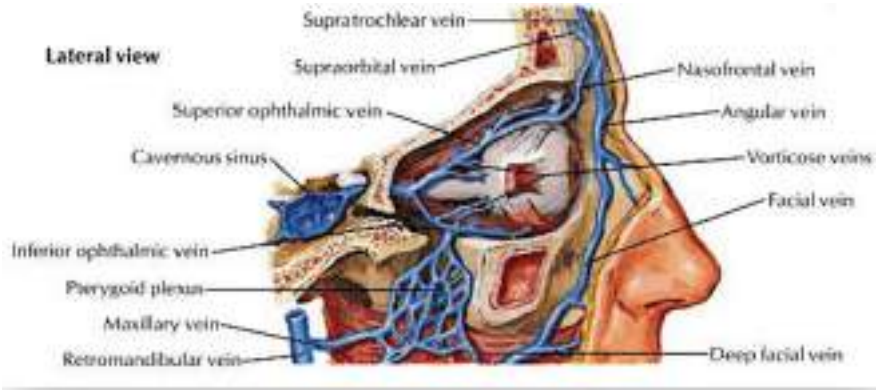
FRONTAL SINUS VASCULATURE

The blood supply is by anterior ethmoidal and supraorbital branch of ophthalmic artery which arises from the internal carotid artery The anterior ethmoidal artery branch of ophthalmic artery, exits orbit from the frontoethmoid suture and traverses to the anterior ethmoid cell[28]The artery on the medial side penetrates the lateral lamella of the cribriform plate to travel anteriorly in the ethmoidal sulcus, where it gives a meningeal branch to the Dura matter and falx cerebri and then re-enters the nasal cavity. The supra orbital artery arises from the ophthalmic artery in the orbit where it crosses the optic nerve. The supraorbital artery runs between the orbital roof periostium and the superior levator palpebrae muscle to exit the orbit at the supra orbital notch. Then it divides into superficial and deep branches supplying the skin, muscles and the frontal periostium, and then anastomosis with the supratrochlear and frontal branches of the supratrochlear arteries.[29]

FRONTAL SINUS VENOUS DRAINAGE

The venous drainage of the frontal sinus is through small mucosa lined vascular pits, or foramina in the anterior and posterior sinus walls. Frontal diploe coalesce and drain into the ipsilateral large frontal diploic vein oriented vertically between the plates of cortical bone, above the supratrochlear notch. In the supra orbital notch, the frontal diploic vein

and supra orbital vein join to form the superior ophthalmic vein, which drains posteriorly into the cavernous sinus at the medial canthus the supraorbital and supratrochlear veins join to form the facial vein. Infection may spread from the face to the cavernous sinus, as there are no valves in the facial and ophthalmic veins.[30]



Venous drainage of frontal sinus[31]

FRONTAL SINUS LYMPHATIC DRAINAGE

Frontal scalp region and forehead lymphatics drain the anterior auricular and parotid lymph nodes. The anterior part of the frontal recess and nasal cavity drain into the submandibular lymphnodes.[30]

FRONTAL SINUS INNERVATION

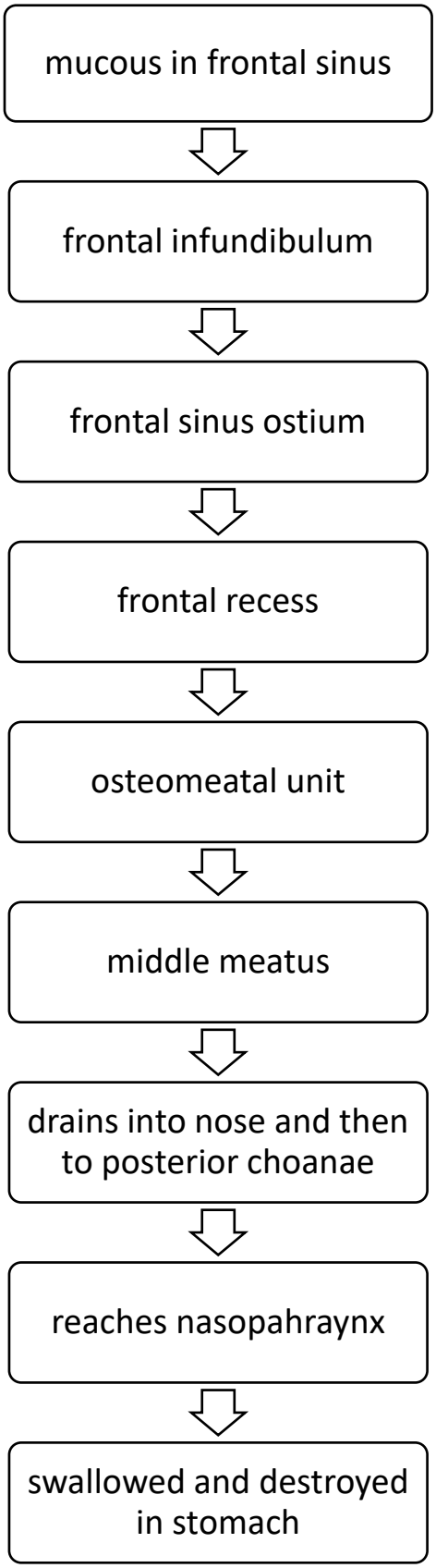
The sensory innervation of the frontal sinus mucosa is derived from the rami of the frontal and nasociliary branches of the ophthalmic nerve. The nasociliary and frontal branches arise before the nerve enters the orbit through the supraorbital fissure.[30]

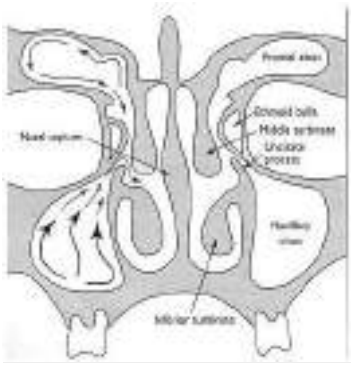
3) Physiological aspects:

The movement of the mucous blanket is referred to as mucociliary clearance. Inflammatory sinus disease results primarily from interference of mucociliary clearance due to compromise of the drainage portals (osteo-meatal channels) of the individual sinus cavities. The mucosa of the paranasal sinuses and nasal fossae is made up of a ciliated cuboidal epithelium that secretes mucus. The cilia are in constant

motion and act in concert to propel the mucus in each sinus toward the sinus ostium and then, once in the nasal choanae back towards the pharynx. The pattern of flow is specific for each sinus and persists even if alternative openings are surgically created in the sinus. In the maxillary sinus, mucous flow is directed centripetally toward the primary ostium. The mucus is then transported through the infundibulum to the hiatus semilunaris, whence it passes into the middle meatus and ultimately into the nasopharynx.[30]

Flow chart for mucociliary clearance and frontal sinus drainage





Mucociliary clearance of frontal sinus[32]

4) Pathophysiological aspects:

FRONTAL SINUSITIS

Acute Frontal Sinusitis:

Acute rhinosinusitis(ARS) is sudden in onset and often follows an upper respiratory tract infection. It is defined by American Academy of Otolaryngology[33] as an increase in symptoms after 5 days or persistent symptoms after 10 days with less than 12 weeks duration. Most common causse is viral URTI. Acute frontal sinusitis is generally a part of acute rhinosinusitis and usually resolves without any complication [26]. Mild symptoms are treated with intranasal corticosteroids or in conjuction with antibiotics. In case of extrasinus complication that is mostly seen in young adults males. The most common is intracranial infection which clinically presents as persistant severe headache, periorbital swelling, altered mental status and with meningeal signs.

COMPLICATIONS OF FRONTAL SINUSITIS

LOCAL:

1. MUCOCELE:

   A mucocele of frontal sinus is an accumulation of mucoid secretion and desqua-mated epithelium within the sinus with distension of its walls and is regarded as a cyst like expansile and destructive lesion. If the cyst invades the adjacent orbit and continues to expand within the orbital cavity, the mass may mimic the behaviour of many benign growths primary to the orbit.[35]

2. PYOCELE:

   A pyocele of frontal sinus is a cystic lesion with accumulation of pus within the sinus walls and is capable of expansion. Floor of the frontal sinus is shared with the superior orbital wall which explains the early displacement of orbit in enlarging frontal mucoceles or pyoceles.[36]

3. OSTEOMYELITIS(POTTS PUFFY TUMOUR):

   Pott puffy tumor is osteomyelitis of the frontal bone with associated subperiosteal abscess causing swelling and edema over the forehead and scalp.[37]

ORBITAL COMPLICATIONS:

1. ORBITAL CELLULITIS (including subperiosteal, intra-orbital abscess):

   Orbital cellulitis is a serious infection that involves the muscle and fat located within the orbit. It is also sometimes referred to as postseptal cellulitis. Orbital cellulitis does not involve the globe itself. The most important distinguishing feature of orbital cellulitis is the presence of ophthalmoplegia, the presence of pain with eye movement, and/or proptosis. Orbital cellulitis also typically causes eyelid swelling with or without erythema.[38]

INTRA-CRANIAL COMPLICATIONS:

1. MENINGITIS:

   Inflammation of brain and spinal cord membranes, typically caused by an infection. Meningitis is usually caused by a viral infection but can also be bacterial or fungal. Symptoms include headache, fever and stiff neck.[39]

2. DURAL ABSCESS:

   An epidural/extradural abscess is an infection that forms in the space between the skull bones and your brain lining (intracranial epidural abscess). An epidural abscess results in a pocket of pus that builds up and causes swelling. It can press against the bones and the membranes that protect the spinal cord and the brain

(meninges). This swelling and the underlying infection can affect sensations and physical movement and can cause other problems [40].

3. SUBDURAL EMPYEMA:

   Subdural empyema (i.e. abscess) is an intracranial focal collection of purulent material located between the dura mater and the arachnoid mater. About 95% of subdural empyemas are located within the cranium; most involve the frontal lobe[41]

4. INTRA-CEREBRAL ABSCESS:

   Intracranial abscesses are uncommon, serious, life-threatening infections. They include brain abscess and subdural or extradural empyema and are classified according to the anatomical location or the etiologic agent. Intracranial abscesses can originate from infection of contiguous structures (eg: otitis media, dental infection, mastoiditis, sinusitis) secondary to hematogenous spread from a remote site (especially in patients with cyanotic congenital heart disease), after skull trauma or surgery, and, rarely, following meningitis.[42]

5. SUPERIOR SAGITTAL SINUS THROMBOSIS:

   Superior sagittal sinus (SSS) thrombosis is an uncommon cause of stroke. Presenting symptoms of raised intracranial pressure may be followed by focal neurological deficits. The presence of headache, hemiparesis, and focal epilepsy in a relatively young patient is indicative of SSS thrombosis. The diagnosis is confirmed by angiography, computed tomography (CT) scan, or magnetic resonance imaging (MRI). The treatment of SSS thrombosis is not uniform, and the role of anticoagulants remains controversial for fear of provoking haemorrhagic cerebral infarctions.[43]

6. CAVERNOUS SINUS THROMBOSIS:

   Infection of paranasal sinuses and orbital complications from these sinus infections can cause thrombophlebitis of the cavernous sinuses. The valveless nature of the veins connecting the cavernous sinus causes easy spread of infection. Onset is abrupt with high fever and chills with near signs of toxaemia. Oedema of eyelids, chemosis and proptosis occur. Cranial nerves are involved individually and sequentially and laterally involves both eyes.[44]

5) Radiological Aspects:-

Radiology of frontal sinus was described by Reardon[33].Various modalities of imaging are radiographs, computed tomography and magnetic resonance imaging

1) Plain Radiography**-**

   Xray like Water's view (occipitomental view) and Caldwell's (occipitofrontal view).

In Water's view Frontal sinuses are projected obliquely and the floor is clearly demarcated.

In Caldwell's view frontal sinus are best visualized and their intervening septa is ideally visualized.

Loss of the septum indicates a chronic infection Sinus radiographs are reliable as integral component of clinical decision-making process as they do not allow adequate evaluation of the disease of the frontal sinuses and the drainage pathways because of overlapping structures.[45]

2) COMPUTED TOMOGRAPHY - Computed tomography is the investigation of choice to study the paranasal sinuses and it also helps to demonstrate mucosal thickening, fluid or calcification in the sinuses. Soft tissues of the orbit and anterior cranial fossa can also be visualized.[46]

Computed tomography of the frontal sinus is used to assess its:
a) Anatomical status

-normal anatomy and anatomical variations,

-extent of pneumatization,

-presence of agger nasi cells and its relation with vital structures,

-presence of congenital bony dehiscence.

b) Pathological status

-delineation of pathology,

-site and extent,

-depth or invasion,

-details of mucosal abnormalities,

-possible cause of pathology,

-probable cause of failure of surgery.[47]

3)MAGNETIC RESONANCE IMAGING -Magnetic resonance imaging is superior to computed tomographic scanning in differentiating tumour from the adjacent inflammatory sinus disease. If complications of sinusitis or a neoplasm is suspected, the study of choice is contrast enhanced magnetic resonance imaging.

Advantages of MRI are:
1) Multiplanar capability,
2) superior soft tissue contrast,
3) lack of ionizing radiations.

Disadvantages of magnetic resonance imaging are
A) Time consumed in scanning is about 30-45 minutes as compared to computed tomographic scan, which takes approximately 15 mins.
B) Noisier and confining than computed tomographic scan and therefore claustrophobic patients are difficult to assess.
The bony margins of the sinuses appear as, a plane of absent signal on magnetic resonance imaging. Stammberger [25]
Magnetic resonance imaging is not a reliable operative road map to guide the surgeon during functional endoscopic sinus surgery.

Singh et al 2002[48] listed the disadvantages of a magnetic resonance imaging scan:

-More expensive

-More time consuming

-Bony detail not well delineated.

6)SURGICAL ASPECTS

CHRONOLIGAL EVENTS IN THE SURGERY OF THE FRONTAL SINUS

Frontal sinus disease is highly morbid with potential likelihood of life-threatening complications, due to its anatomic proximity to anterior skull base and the orbit.

History of frontal sinus surgery can be divided into following stages:

1. Era of trephination (1750):[49]
2. Era of radical ablation procedures (1895): [50]
3. Era of conservative procedures (1905):[50]
4. External fronto-ethmoidectomy 1897 – 1921[51]
5. Osteoplastic anterior wall approach (1958):[52]
6. Endoscopic intranasal approach [14]

Era of trephination (1750):

Frontal sinus surgery was first described in 1750. It was in 1884 Alexander Ogstun described a trephination procedure where an opening was made in the anterior table of frontal sinus to evacuate the sinus cavity. He also dilated the nasofrontal duct (a duct connecting the infundibulum and frontal sinus) and curetted its mucosa for better drainage from the frontal sinus and placed a drainage tube inside the nasofrontal duct to prevent stenosis.[49]

Era of radical ablation procedures (1895):

Kuhnt[49] in 1895 described a procedure where he removed the anterior wall of frontal sinus to clear the diseased mucosa of the frontal

sinus. He stripped the mucosa up to the frontal recess and stented the frontonasal duct to improve the drainage.

In 1898 Riedel [53] obliterated frontal sinus by complete removal of anterior table and floor of frontal sinus with stripping of mucosa which was performed in a patient with osteomyelitis of frontal bone but caused an unsightly deformity of skull.

Killian[50]

In 1903 advocated retention of 1 cm bar of supraorbital rim. Killian was able to avoid deformity by retaining this bar of bone and also advocated ethmoidectomy combined with rotation of mucosal flap to cover the frontal recess area. Killian's procedure had complications like restenosis, supraorbital rim necrosis, post op meningitis and mucocele formation etc.[50]

Era of conservative procedures (1905):

Major advantage is avoidance of cosmetic defects. They involved intranasal approach to frontal sinus. It was Knapp[51] in 1908 who performed external Fronto ethmoid surgery. He approached the frontal sinus through its floor, removed the diseased mucosa and stented the frontonasal duct to prevent restenosis.

In 1908 Halle [51] chiselled out the frontal process of maxilla and used a burr to remove the floor of frontal sinus.

In 1914, Lothrop[14]enlarged drainage pathway of the frontal sinus drainage using the intranasal approach. He combined intranasal ethmoidectomy with external ethmoidal approach and managed to create a common fronto-nasal communication by removing the frontal sinus floor, intersinus septum and the superior portion of nasal septum. He also emphasised that resection of medial orbital wall lead to prolapse of orbital contents into the ethmoid area and thereby obstruction to the sinus drainage.

External fronto-ethmoidectomy 1897 – 1921:

In 1897 Jenson performed the first external Fronto ethmoidectomy in Germany. Lynch and Howarth in 1921 popularized resection of floor of the frontal sinus with dilatation of the frontal sinus outlet via external approach. This approach is hence known as Lynch Howarth procedure [52].A curvilinear incision is made just below the medial end of eyebrow. It is curved medial to the medial canthus. The frontal process of maxilla and lamina papyracea is removed. Frontal sinus is entered via its floor and the lining mucosa is curetted. A stent is placed in the frontal sinus ostium to prevent stenosis. The stent is left in place for a period of 4 weeks. Boyden used silicone tube to prevent stenosis.[54]

Osteoplastic anterior wall approach[55](1958):

This procedure became popular during 1960's. Backer introduced radiographic plate to outline the frontal sinus. This procedure was associated with the risk of haemorrhage

Endoscopic intranasal approach[56]

With the advent of nasal endoscopes (angled) approach to the frontal sinus outflow tract has become easy

Frontal sinus rescue procedure

Citardi et al 2001[57] concluded that standard endoscopic frontal sinusotomy was developed to take advantage of mucosa-lined rigid frontal recess walls. During this procedure, the partitions of the anterior ethmoid cells that narrows the frontal recess area are gently fractured with a 45- or 90-degree curette, which is maneuvered in a posterior to anterior direction under the visualization provided by a 30- or 70-degree telescope. Each of the resultant bony fragments are then removed with giraffe forceps, and all mucosa is conserved, especially in the vicinity of the frontal ostium. During standard frontal sinusotomy, the frontal ostium is not enlarged,

and the bony boundaries of the frontal recess are not disrupted; rather, the anterior ethmoid partitions that can obstruct the frontal sinus drainage pathway in the frontal recess are atraumatically removed. In the situation of frontal sinusitis after middle turbinate amputation, the bony middle turbinate remnant (i.e., the medial frontal recess wall) has been at least partially mobilized. In its lateralized position, this tiny bony fragment produces a bony stenosis of the frontal ostium. Standard endoscopic frontal sinusotomy cannot address this bony fragment and secondary frontal ostium stenosis. Endoscopic frontal sinusotomy with mucoperiosteal flap advancement, targets recurrent or persistent frontal sinusitis caused by frontal recess scar after middle turbinate amputation. This method, termed frontal sinus rescue procedure, uses an endoscopic frontal sinusotomy and directly compensates for persistent middle turbinate lateralization and subsequent frontal ostium restenosis

SURGICAL APPROACHES TO THE FRONTAL SINUS-

NON-ENDOSCOPIC

- Frontal sinus Trephination[58]
- External frontoethmoidectomy[59]

ENDOSCOPIC APPROACHES (FULADA CONCEPT)[60]

1) Conventional Endoscopic technique

- Type-1 Simple Drainage (DRAF 1) [61]
- Type-2 Extended Drainage (DRAF 2)[62]
- Type -3 Endonasal median Drainage (DRAF 3, Modified Lothrop)[63]

2) Axillary flap approach[11]

FRONTAL SINUS TREPHINATION-1 cm incision is made just above the medial end of eyebrow and with a 0.5 cm drill hole the anterior wall of frontal sinus is opened. Preoperative CT should be done to see extent of frontal sinus and to prevent injury to dura[**58]**

EXTERNAL FRONTOETHMOIDECTOMY

A Curved medial and concave incision is taken towards medial canthus of eye straight down to bone. Frontal sinus is reached by osteoclastic resection of lacrimal bone, part of frontal process of maxilla and frontal sinus floor. Ethmoid cell system is resected to obtain an open cavity between frontal sinus, ethmoid and nasal cavity.[59]

ENDOSCOPIC APPROACHES (FULADA CONCEPT)[60]

1) Conventional endoscopic technique-

The conventional endoscopic technique involves use of 30^{o}, 45 and 70^{o} telescopes. The more the curved endocope, the greater the degree of difficulty of dissection, orientation and manipulation of the angled endoscope [11].

After performing a standard uncinectomy with maxillary antrostomy, anterior ethmoidectomy, and posterior ethmoidectomy (if indicated), the location of the anterior ethmoid artery is identified. The commonest anatomic landmark to identify the artery is the insertion of the middle turbinate basal lamella at the skull base. This site marks the sharp upward slope of the skull base and is the posterior entrance to the frontal recess. The angled curettes are passed up the posterior frontal recess wall behind the cells, such as agger nasi cells or frontal cells. The cell walls are fractured forward and inferiorly if attached to mucosa or with giraffes forceps if free of bony attachments. The key to this procedure is preservation of the frontal recess mucosa, because inadvertent removal will lead to osteoneogenesis, scarring, and consequent frontal sinus stenosis. Instrumentation in the frontal recess is dictated by surrounding structures. Forward movement is the safest because there are no vital structures anteriorly, only the dense anterior buttress bone. Medial to lateral movement is the next safest, because the superior medial orbital wall tends to be thicker than the lamina papyracea. The instruments should not be used in an anterior-to-posterior direction or lateral to-medial, because of risk of skull base penetration or injury to the thin lateral cribriform plate lamella. Both of these bony walls are thin and highly prone to fracture with subsequent CSF leak.[11]

• Type-1 Simple Drainage (DRAF 1)[61]

This involves complete removal of anterior ethmoidal cells and uncinate process. This procedure involves complete removal of the anterior ethmoid cells and uncinate process, Obstructive frontal cells surrounding the frontal recess to the frontal ostium. In the majority of cases the frontal sinus heals because of the improved drainage via the ethmoid cavity.[61]

• Type-2 Extended Drainage (DRAF 2)[62]

This extended drainage procedure involves, after ethmoidectomy, resection of the floor of the frontal sinus from lamina papyracea to middle turbinate (IIa / Nasofrontal approach II) or nasal septum anterior to the ventral margin of the olfactory fossa (IIb /Nasofrontal approach III).[62]

In the classification of May and Schaitkin type IIa [64] corresponds with NFA II (nasofrontal approach) and type IIb with NFA III. When type IIa drainage is considered to be too small in regard to the underlying pathology, it is better to perform type IIb drainage. It has been assessed that the maximum size of the neoostium of frontal sinus that can be achieved in Type IIa procedure is 11 mm with a mean of 5.6mm (H Pancherz et al.)[65]. If neoostium is less than 5 mm in diameter, soft flexible silicon stents are used. If one needs to achieve a larger drainage opening like type II-b, a drill is used because of the increasing thickness of the bone medially towards the nasal septum. At this point microscope assistance is required. In revision cases after incomplete ethmoidectomy, it is recommended that a wide approach to the ethmoid sinuses is created using a microscope and drill or punch when possible. Wide approach to ethmoid is achieved by resection of; Lacrimal bone, Part of agger nasi cells, Frontal process of maxilla till lamina papyracea is clearly visible. This allows better visualization of frontal recess. Frontal recess is identified by using middle turbinate and where identifiable anterior ethmoidal artery as landmark. Frontal infundibulum is exposed and anterior ethmoidal cells are resected. Preoperative CT scan may reveal the presence of so called frontal cells. These are anterior ethmoidal air cells that has encroached into the frontal sinus giving a

false impression that the frontal sinus has been properly opened. If these frontal cells are present, a procedure known as uncapping the egg is performed resulting in type IIa drainage. After type IIa drainage, further widening to produce a type IIb drainge is done by introducing a diamond burr into the clearly visible gap in the infundibulum which is then drawn across the bone in medial direction.

During surgery, frontal sinus opening is bordered by bone on all side but mucosa is preserved on at least one side. Rubber finger stall can be introduced into the sinus for 5 days. They provide safe haemostasis, are a stimulator of re-epithelialization of bare bone, are cost-effective and painless to remove. The risk of adhesions and synechiae is low because this type of packing suppresses the development of granulations. Postoperative Frontal Sinusitis after Type I and Type II Drainage – Sometimes after ethmoidectomy and type I as well as type II drainage, the patients may develop more problems in the frontal sinus than before surgery. Postoperative sinus CT will provide information if frontal sinusitis has developed. The pathogenesis of recurrent frontal sinusitis after surgery Remnant ethmoidal cells Mechanical irritations of the mucosa in the frontal recess l/recurrent sinusitis can result in a severe scar around Killian's infundibulum. Both pathologies may result in blockage of the frontal sinus drainage

This can be avoided by performing; 1. A complete anterior ethmoidectomy. 2. Using extremely atraumatic handling of the frontal recess mucosa. For treatment the following procedures recommended: 1. Type IIa drainage if a type I procedure was performed. 2. Previously a type IIb drainage if a type IIa. 3. Type III Drainage after a previous type IIb

- ENDOSCOPIC DRAF III PROCEDURE (MODIFIED LOTHROP, Endonasal MEDIAN DRAINAGE / NFA IV)[63]

This procedure involves removal of the inferior portion of the interfrontal septum, the superior part of the nasal septum, and the frontal sinus floor till the lamina papyracea. The lamina papyracea

and posterior walls of the frontal sinus remain intact. To achieve maximum possible opening, it is helpful to identify 1st oflactory fibre on both sides. To achieve the maximum possible opening of the frontal sinus, it would be helpful to identify the olfactory fibers on both sides. A rubber finger stall is placed into each frontal sinus and two are put into ethmoid cavity on each side for 7 days. Leaving rubber finger stalls for one week carries the following advantages –

1. The fibrinoid phase of wound healing is somehow overcome. Reclosure of the large drainage by scars is remarkably reduced, since bare bone is re-epithelialized almost completely

2. Sedation and general anaesthesia are not necessary for packing removal. Rubber finger packs do not bind to the wound. Major part of surgical cavity gets re-epithelised making postoperative treatment simple. Advantage over classical Jansen, Lynch and Howarth approach[55]– Bony margins around frontal sinus drainage are preserved increasing long term stability and reducing scarring and complications like frontal sinusitis and mucocele formation. In revision cases, type III drainage can begin from possible two points, from the lateral or medial side. Primary medial approach If previous ethmoidal surgery was complete, and the middle turbinate is absent. The medial approach starts with the partial resection of the perpendicular plate of ethmoid of the nasal septum, followed by identification of the olfactory fibres on each side. Primary lateral approach If previous ethmoidal surgery was incomplete and the middle turbinate is still present as a landmark. Post operative Therapy – The patients are given the following instructions to ensure proper healing:

1. Irrigate the nasal cavities with saline solution at least once a day, sometimes more frequently

2. Use one of the corticosteroid sprays 1–3 times/ day

3. The recommendation is made to use liquid paraffin 1 hour after the use of corticosteroid spray, for general care of the mucosa. Antibiotics –

for 1 to 2 weeks. Antiallergic treatment - for 6 weeks in proven cases of allergy

Post operative evaluation -follow up period – 10 – 12 years [4].

Criteria for assessment – objective and subjective categorized in following grades;

Grade 1 - endoscopically normal mucosa, independent of subjective complaints.

Grade 2 – endoscopically inflamed mucosa with subjectively free of symptoms

Grade 3 – endoscopically inflamed mucosa with no subjective improvement. Maximum success rate is usually achieved by type III drainage followed by type II and I. Recurrence rate - lesser compared to osteoclastic techniques of Jansen – Ritter and Riedel[66].

This can be concluded that the endonasal frontal sinus type I–III drainage procedures provide suitable surgical options for the treatment of frontal sinus disease. In cases where the endonasal approach is not possible or is unsuccessful, the osteoplastic flap procedure with or without obliteration may provide a solution. The chance of complete re-epithelization of eventually bare bone is very likely with the endonasal frontal sinus operations, since they respect the outer osseous borders of the newly created frontal sinus drainage and minimize the danger of frontal sinus outlet shrinking, thus preventing mucocele formation. Hence the classic external frontoorbital frontal sinus operations according to Jansen-Ritter or Lynch or Howarth are considered obsolete for the treatment of chronic inflammatory diseases of the frontal sinus

2) Axillary flap approach [11]

Axillary flap[11] technique was designed to overcome the problems in endoscopic Sinus Surgery. While surgical field is full of blood, and more time is taken for placing angled endoscopes in frontal recess before surgical dissection takes place. This procedure allows a large part of

dissection in frontal sinus with 0-degree telescope, a straight forward looking telescope.

Surgical technique

An incision is made 8mm above axilla of middle turbinate and this is brought 8mm forward, turned down vertically up to axilla, turned back under axilla on to the roof of middle turbinate

Full thickness mucoperiosteal flap is elevated with a sharp freer elevator and parked between septum and middle turbinate. A Hajek koeffler punch is used to remove ant wall of agger nasi cell. Agger nasi cell is entered by inferomedial approach.We enter the frontal recess. then the probe is passed superolaterally in frontal drainage pathway and all obstructing cells are removed and flap reposited back

Mucosal flap is carefully reposited to prevent scarring and completely covering the ostium back. Pg Wormaldt et al[14] conducted retrospective study on review of 64 consecutive patients (118 sides) undergoing axillary flap exposure of the frontal recess between November 1998 and July 1999. The frontal sinus ostium was identified in 96% of patients (104 of the 118 sides). Eight sides had Kuhn type 3 cells that required removal for clearance of the frontal ostium. Eighty-two percent of sides (97 sides) had endoscopically healed sinuses without symptoms after an average follow-up of 15.4 months. Six sides had middle meatal adhesions requiring division under local anaesthesia. One patient required revision surgery. It was suggested that the axillary flap approach to the frontal recess provides excellent access to the frontal recess and allows clearance of cells in the recess with identification of the frontal ostium in the vast majority of cases.

7) Complications of frontal sinus surgery

The lack of orientation, proper instrumentation, anatomical knowledge and exposure of frontal recess leads to complication of frontal sinus [67]

Stankiewicz JA 2009[67] classified complications as early and late

1) Early complications

A Haemorrhage

B Csf(cerebrospinalfluid) leak

C Floppy middle turbinate

D Retro-orbital hematoma

2) Late complications

A Synechiae

B Encephalocele

C Frontal recess obstruction

8) Literature On frontal sinusotomy

Part I Clinical subjects

Kang et al[68] conducted a study to examine the surgical error and task performance of angled telescopes when compared to use of the 0° telescope in frontal recess surgery. In his study, 10 fully trained otolaryngologists undergoing training on cadavers using 0, 30, 45 and 70° telescopes bilaterally, found better performances using 70-degree telescope as compared to 0 degree.

Similarly, Shirazi et al[69] conducted a retrospective chart analysis on 97 patients who underwent endoscopic modified Lothrop procedure to measure outcomes such as the need for revision surgery including an osteoplastic flap (OPF), improvement in patients' symptoms and rate of cerebrospinal fluid (CSF) leak. They found that modified endoscopic Lothrop procedure is better than Osteoplastic flap approach in recalcitrant frontal sinus disease as major complications is rare using modified endoscopic Lothrop procedure.

Wormald et al[70] a study of 14 patients found that modified Lothrop procedure is effective in the treatment of complicated frontal sinusitis as compared to the Osteoplastic flap approach.

Mobashir et al[71] a study on 24 patients comparing different approaches addressing frontal sinus disease (Zero angled endoscopic approach and resection of the superior attachment of uncinate process) found that frontal sinus operated through intact bulla technique is less invasive guarding against anterior ethmoidal artery injury.

A prospective analysis of computed tomography (CT) of the paranasal sinuses and endoscopic cadaver dissection was undertaken by Floreani et al [72] on 22 cadavers to investigate the radiologic and endoscopic anatomy of the anterior ethmoidal canal (AEC) and feasibility of endoscopic ligation of the anterior ethmoidal artery (AEA) and found that AEA ligation is visible in 20% of patients. So, after trauma external approach is better.

Wormald et al[14] 2002 a study of 64 patients (118 sides) to evaluate the access to the frontal recess using the axillary flap approach by identifying the frontal ostium during endoscopic sinus surgery found that the Axillary flap approach provides better access to frontal recess. It also allows clearance of the all the diseased cells.

Nomura et al[73]2011 study of 12 patients to study the outcomes of frontal mucoceles treated with conventional endoscopic sinus surgery to predict risk factors for poor outcomes in order to define surgical indications. He concluded that though conventional endoscopic sinus surgery (CESS) is useful for frontal mucoceles but a patient with short anterior–posterior distance and bone thickening may need an axillary flap, Draf type IIb, or Draf type III procedure.

Chen et al[74] 2014 study of 124 patients was undertaken to determine the incidence of middle turbinate lateralisation (MTL) after an axillary flap is performed to evaluate whether middle turbinate conchopexy influenced lateralization. They also studied whether additional patient and disease factors affected the incidence of lateralization. They found that middle turbinate lateralization was common with axillary flap approach with 14.5% and 17.4% in short term and long-term cohorts. Also various patient and disease factors did not affect the incidence of lateralisation.

Part II Cadaveric

DIMENSIONS OF THE FRONTAL SINUS:

The frontal sinus has variable dimensions. Robert B et al 2001 in his study documented that average height of 28-32mm, breadth 24-26mm and depth of 18-20mm in an adult [75]

In adults the average dimensions of the frontal sinus recorded in different studies are:

Parameter of frontal sinus (In mm)	**VanAleya 1939 study 76]**	**Ritter 1975 study [76]**	**Lang 1983 study [76]**	**Milosslawsky 1903 study [76]**
Height	28	28	24.3 (5-66)	24.3
Width	24	27	29.0 (17-49)	-
Depth (Antero-posterior)	20	17	20.5 (10-46.5)	-

In the paediatric age group, the average dimensions of the frontal sinus recorded are:

Handerhuber series[76]: 1982

Parameter (in mm)	**1-4 years**	**4-8 years**
Height	6-9	15-16
Width	4-7	8-10
Length	4-8	6-10

FRONTAL SINUS OSTIUM

The position of the opening of frontal sinus is variable and commonly it is present medially.

The frontal sinus ostium is at a distance of 59-70mm (average 65mm) from the anterior nasal spine.[76]

A study by Gaafar et al [77]2001 conducted on 30 embalmed cadaver half heads found that agger nasi is present in 23 specimens of which 14 specimens with 1 cell/ specimen, 6 specimens with 2 cells/specimen, 3 specimens with 3 cells/specimen.

Ximendes et al. study 2018[78]on 13 cadavers that is 26 sides, found agger nasi cells in 23 cavities. Similarly, Orhan et al[79]. 2017 a Turkish study [79] of 20 cadavers, agger nasi cells were seen in 8 cadavers.

The estimation of the size of frontal ostia in cadavers was studied only by Gaafar et al 2001 [77] who found a mean ostia diameter of 5.6mm ± 0.9.

In present study, we evaluated the distance of frontal ostium from the anterior nasal spine, the distance of frontal ostium from the middle turbinate and presence of agger nasi cells

Systematic review of various studies

PART I CLINICAL STUDY

Study By	Year	No. of Subjects		Result
		Cadaver	Patient	
Kang et al[68]	2002	8		0-degree telescope better than 70-degree telescope
Shirazi et al[69]	2007		97	EMLF is better than OPF in recalcitrant frontal sinus disease
Wormald et al[70]	2002		14	EMLF is better than OPF with obliteration in terms of complication of frontal sinusitis
Mobashir et al[71]			24	Frontal sinus operated through intact bulla technique is less invasive guarding against anterior ethmoidal artery injury
Floreani et al [72]	2006	32		AEA ligation is visible in 20% of patients so after trauma external approach is better
Wormald et al[14]	2002		64	Axillary flap provides excellent acees to frontal recess
Nomura et al[73]	2011		12	Axillary flap or Draf type IIb or III are more invasive procedure for patients with short AP distance
Chen et al[74]	2014		124	Middle turbinate lateralisation was more common with axillary flap as compared to conventional

PART II Cadaveric study

Name of Study	Year	No. of Cadavers studied	Frontal Ostium Distance from Anterior Nasal Spine (FO-ANS)	Frontal Ostium distance from middle turbinate (FO-MT)	Ostium size in cadaver	Agger nasi cells present in number of cadavers
Gaafar et al.[77]	2001	30	-	-	5.6mm ± 0.9	23 cadavers
Orhan et al.[79]	2017	20	-	-	-	8 cadavers
Ximendes etal[78]	2018	13 (26 sides)	-	-	-	23 cavities

ANS= Anterior nasal spine

MT = Middle turbinate

FO = Frontal ostium

MATERIALS AND METHODS

The frontal sinus study was undertaken in 2 parts

Part I Clinical study

Part II Cadaveric study

PART I CLINICAL STUDY

Source of Data

In the present study subjects undergoing frontal sinusotomy by conventional and axillary flap endoscopic technique shall be compared in the department of Ent and Head and Neck Surgery Dayanand Medical College and Hospital, Ludhiana

Group a, Conventional approach 60 subjects

Group b, Axillary flap approach 60 subjects

7.2 METHOD OF COLLECTION OF DATA

INCLUSION CRITERIA

Patients with frontal sinus pathology namely

1) Sinusitis
   - acute
   - chronic
2) Sino nasal polyposis
3) Mucoceles

EXCLUSION CRITERIA

1)Revision cases of frontal sinus surgery

2)Malignancies of frontal sinus

3)Head trauma involving frontal sinus

Ear nose throat examination

This would include besides gross examination

1) Anterior rhinoscopy
2) Posterior rhinoscopy
3) Diagnostic nasal endoscopy
4) Computed tomography/Magnetic resonance imaging

No. of Patients

60 patients were enrolled in the study over a period of 1.5 years

STATISTICAL ANALYSIS

Data was described in terms of range, mean±standard deviation (±SD), frequencies (No of cases) and relative frequencies (%age) as appropriate.

OUTCOME

Evaluation of frontal recess was carried out in subjects having undergone frontal sinusotomy by axillary flap & conventional technique during telescopic frontal sinusotomy by diagnostic nasal endoscopy at 1 month,3 month and 6 months to visualize ostium for

1) Webbing
   - Membranous web
   - Fibrous web

2) Edema

3)Neoosteogenesis

4)Polypi

5)To measure frontal ostium using indigenously designed wire loops

Endoscopes

45-degree endoscope 70-degree endoscope 0-degree endoscope

Wire loops of 2mm,4mm,6mm and 8 mm

(To measure frontal ostium postoperatively)

2mm (silver)

4mm(black)

6 mm (yellow)

8mm(white)

PART II CADAVERIC STUDY

Anthropometric assessment of frontal sinus was carried out in formalin preserved cadaveric specimen in department of anatomy, Dayanand Medical college and Hospital

METHOD OF COLLECTION OF DATA

INCLUSION CRITERIA

Frontal sinus assessment in formalin preserved 10 cadaveric heads in sagittal sections

EXCLUSION CRITERIA

Shredded specimen was not included

Outcome

(i) To measure frontal sinus ostium from anterior nasal spine and from anterior part of middle turbinate.

Caliberated scale was used for same

(ii) Shape of frontal ostium was recorded

(iii) Different diameters suction tips were used to check size of frontal ostium.

Diameters of tip used were 3mm, 4mm, 5mm

(iv)Presence of aggernasi was noted in cadaveric specimens.

Suction tip used to measure frontal ostium

OBSERVATIONS AND RESULTS

PART I: CLINICAL STUDY

In the present study 60 subjects with 120 operative sides who met inclusion and exclusion criteria were included in study from dept of otorhinolaryngology in Dayanand medical college and hospital, Ludhiana and were analysed for the under-mentioned aspects

a) Demographic
b) Clinical
c) Endoscopic
d) Radiological
e) Postoperative outcome

PART II: CADAVERIC STUDY

Cadaveric study of the frontal sinus was undertaken in the department of anatomy. The frontal sinus was studied in 10 fresh frozen sagittal heads

PART I: CLINICAL STUDY

A) Demographic profile

Table I

Age distribution of patients

N=60

Age group	No. of cases	Percentage
10-20	8	13.3%
21-30	8	13.3%
31-40	14	23.3%
41-50	11	18.3%
51-60	11	18.3%
> 60	8	13.3%

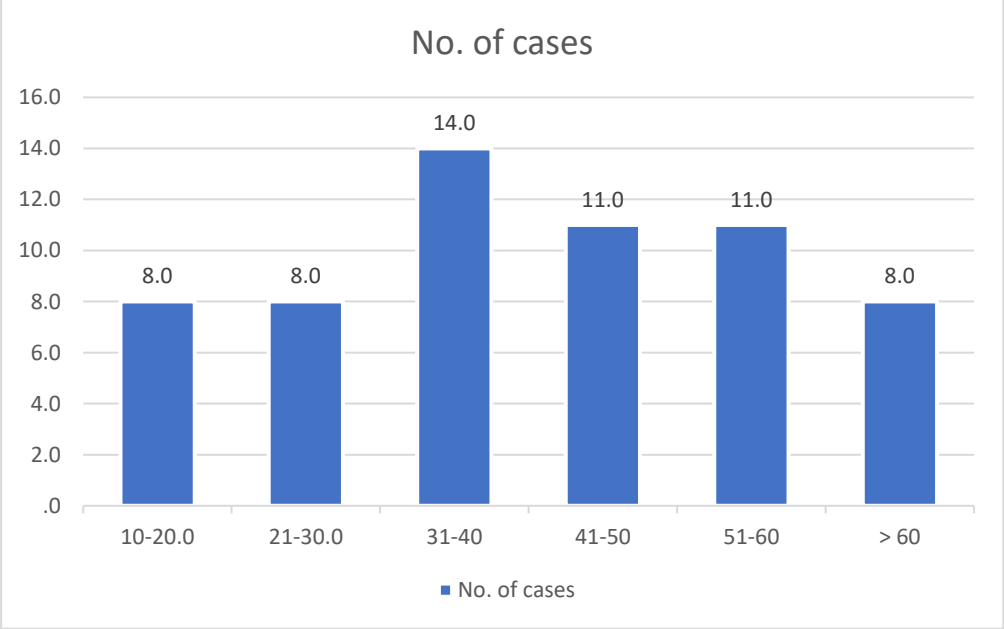
N= total number of patients %=percentage of patients

Maximum number of patients were in the age group of 31-40 years that is 14 (23.3%) followed by 41-50 years (18.3%) and 51-60 years (18.3%).

Patients were in age group of 10 years to 85 years

Fig I

Age distribution of patients



Maximum number of patients were in the age group of 31-40 years

Table II

Gender distribution of patients

N= 60

Sex	No. of cases	No. of sides	Percentage
F	14	28	23.3%
M	46	92	76.7%

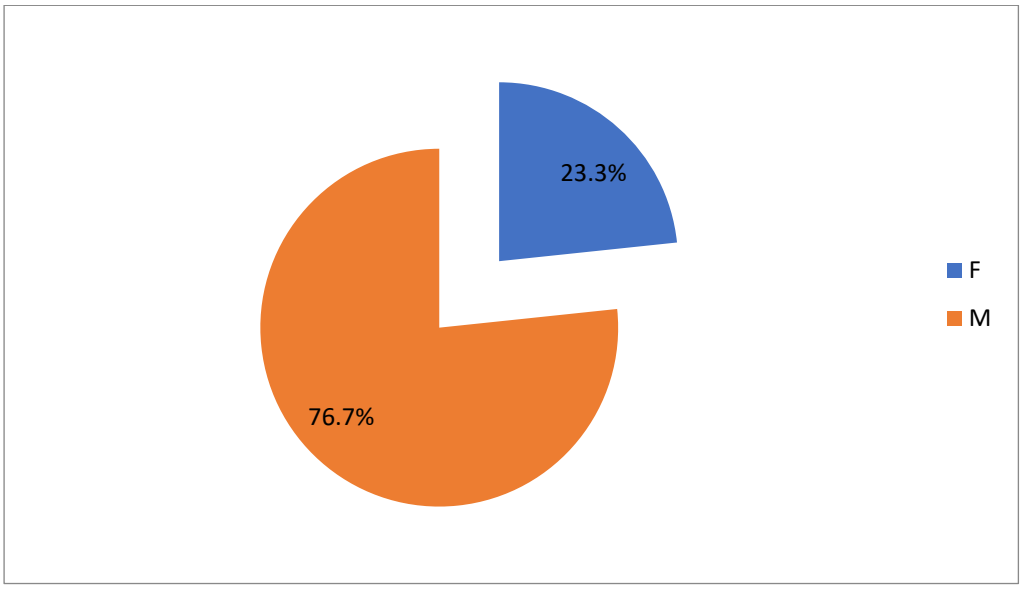
N= total number of patients %=percentage of patients

Male patients 46(77%) outnumbered the female 14 (23%) in our study. Either gender patients were in the age group of 10-85 years.

The selection of patients was random and irrespective of gender.

Fig II

Gender distribution of patients



Male patients (77%) outnumbered female patients

Table III

Socio economic status

N=60

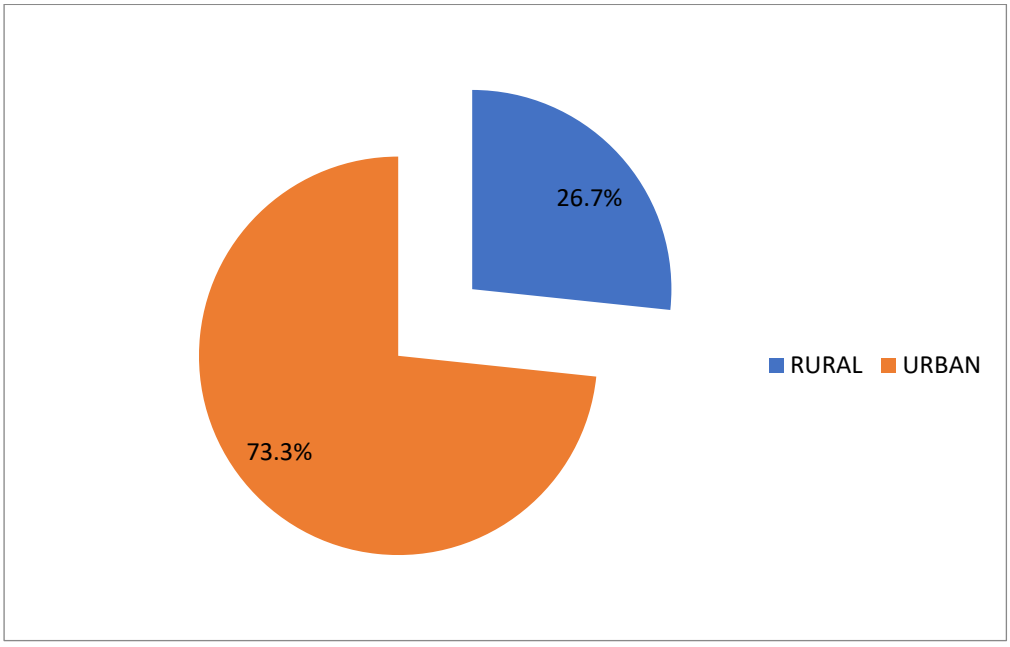
Socio economic status	No. of cases	Percentage
Rural	16	27%
Urban	44	73%

N= total number of patients %=percentage of patients

Majority of patients 44 (73%) were from urban background and 16(27%) from rural background

Fig III

Socio economic status



Majority of patients (73%) were from urban area

Table IV

Occupation of patients

N=60

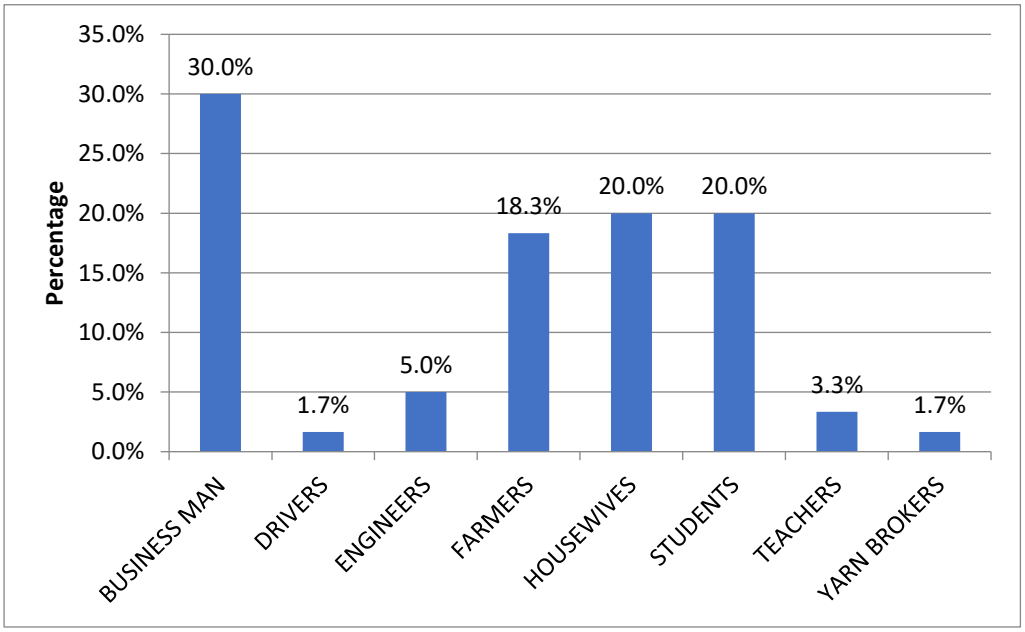
Occupation	No. of cases	Percentage
BUSINESS MAN	18	30.0%
DRIVER	1	1.7%
ENGINEERS	3	5.0%
FARMERS	11	18.3%
HOUSEWIVES	12	20.0%
STUDENTS	12	20.0%
TEACHERS	2	3.3%
YARN BROKER	1	1.7%

N= total number of patients %=percentage of patients

Subjects with business background 18 patients (30%) followed by housewives and students 12 patients (20%) were noticed in the present study

Fig IV

Occupation of patients



The majority patients in our study were businessman 18(30%) followed by students and housewives 12 (20%)

B) CLINICAL PRESENTATION

Table V

Patient Presentation

N= 60

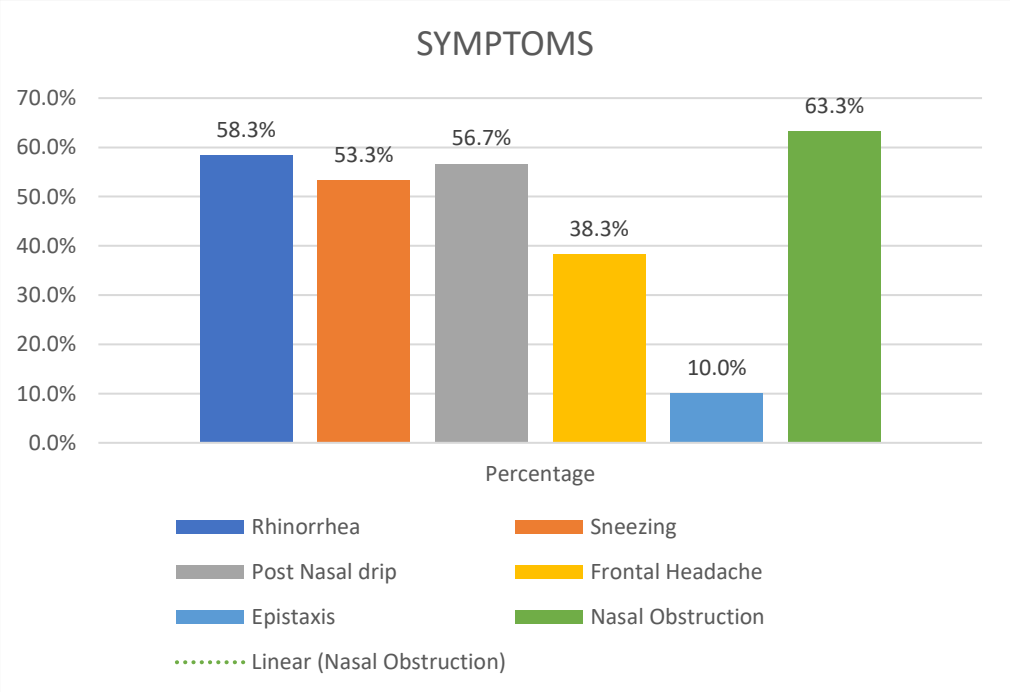
Symptoms	No. of cases	Percentage
Rhinorrhoea	35	58.3%
Sneezing	32	53.3%
Post Nasal drip	34	56.7%
Frontal Headache	23	38.3%
Epistaxis	6	10.0%
Nasal Obstruction	38	63.3%

N= total number of patients %=percentage of patients

In Our Study Majority of Patients Presented with Nasal Obstruction 35 (63.3%) followed by rhinorrhoea 35(58.3%)

Fig V

Patient Presentation



Majority of patients presented with nasal obstruction 35 (63.3%)

Table VI

Rhinorrhoea

N=60

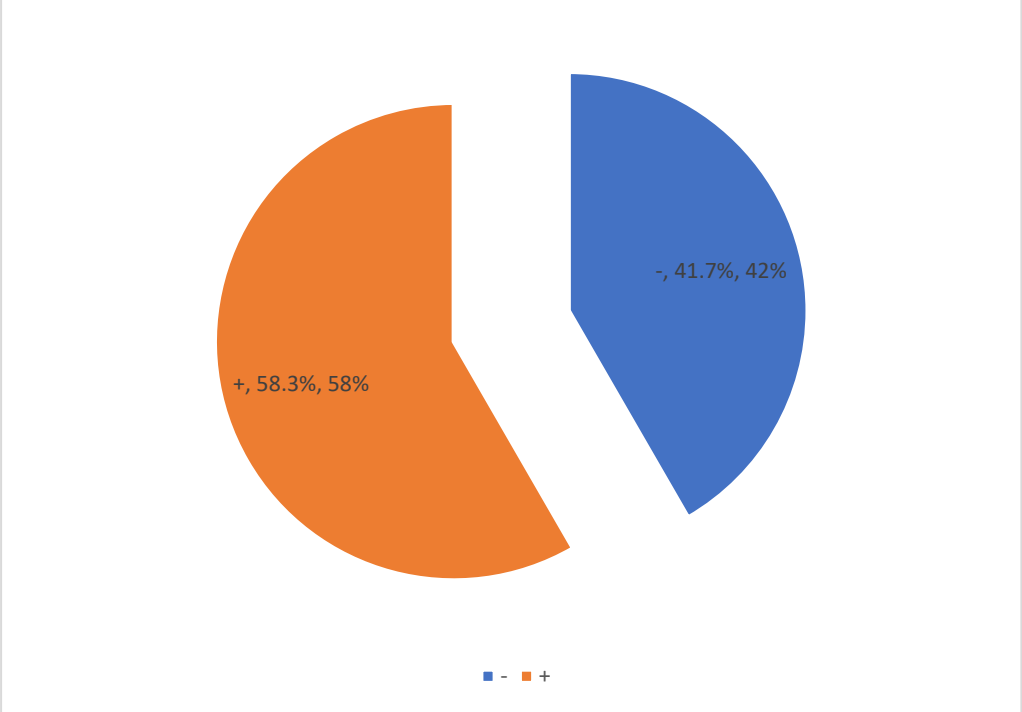
Rhinorrhoea	No. of cases	Percentage
Absent	25	41.7%
Present	35	58.3%

N= total number of patients %=percentage of patients

In our study, Rhinorrhoea was seen in 35(58.3%) cases.

FIG VI

Rhinorrhoea



Rhinorrhoea was present in 58.3 %

TABLE VII

Duration of rhinorrhoea

N=35

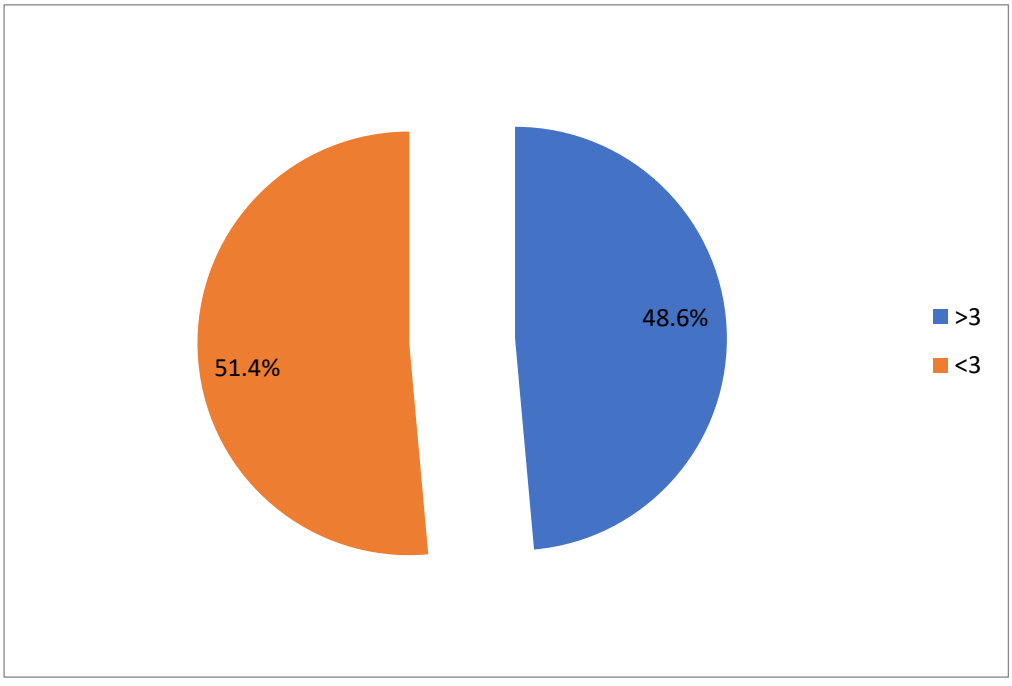
Rhinorrhoea Duration	No. of cases	Percentage
>3	17	48.6%
<3	18	51.4%

N= total number of patients %=percentage of patients

The duration of rhinorrhoea was less than 3 months in 18(51.4%) patients. Minimum duration was 1 month and maximum was 3 years

FIG VII

Duration of rhinorrhoea



The duration of rhinorrhoea was less than 3 months in majority of patients 18 (51.4%).

Table VIII

Sneezing

N=60

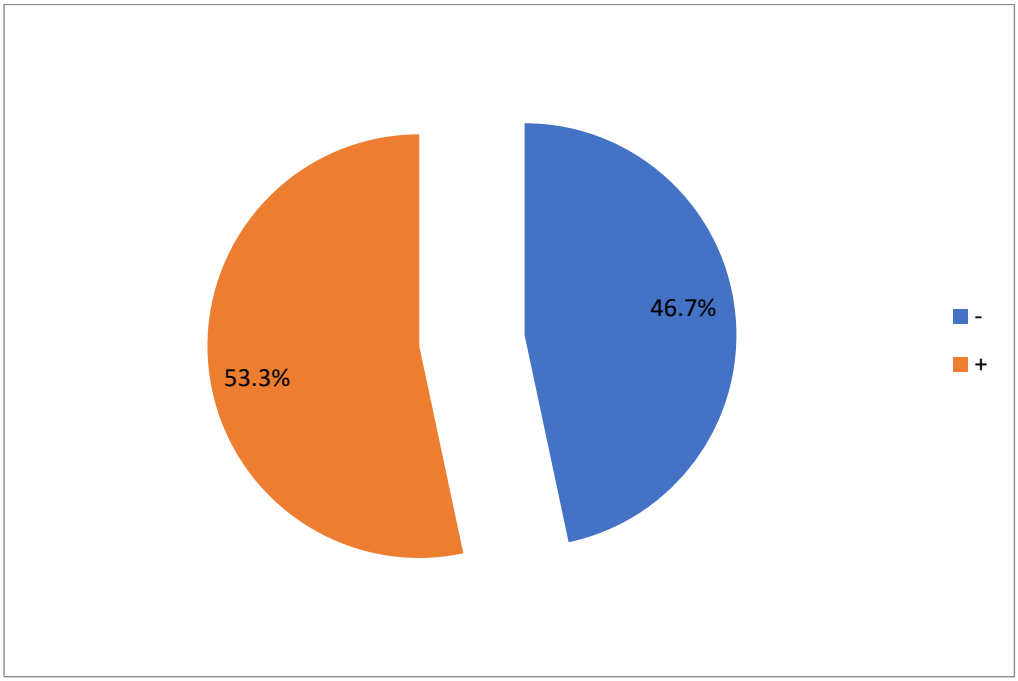
Sneezing	No. of cases	Percentage
Absent	28	46.7%
Present	32	53.3%

N= total number of patients %=percentage of patients

Out of 120 frontal recesses operated in 60 patients, sneezing was present in 32 (53%)

Fig VIII

Sneezing



32(53.3%) patients presented with sneezing

Table IX

Sneezing Duration

N=32

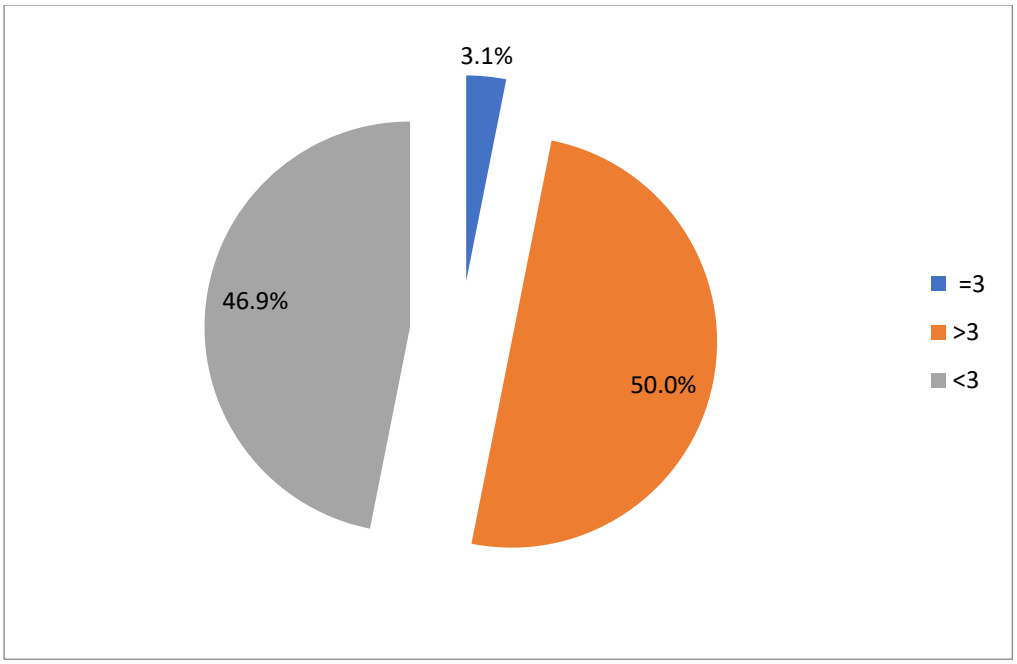
Sneezing Duration time	No of patients	Percentage
=3 months	1	3.1%
>3 month	16	50.0%
<3 month	15	46.9%

N= total number of patients with sneezing %=percentage of patients

In 32 patients who had sneezing, maximum number of patients (50%) had duration more than 3 months.

Fig IX

Duration of sneezing



Maximum number of patients (50%) who had sneezing, the duration was more than 3 months.

TABLE X

Post nasal drip

N=34

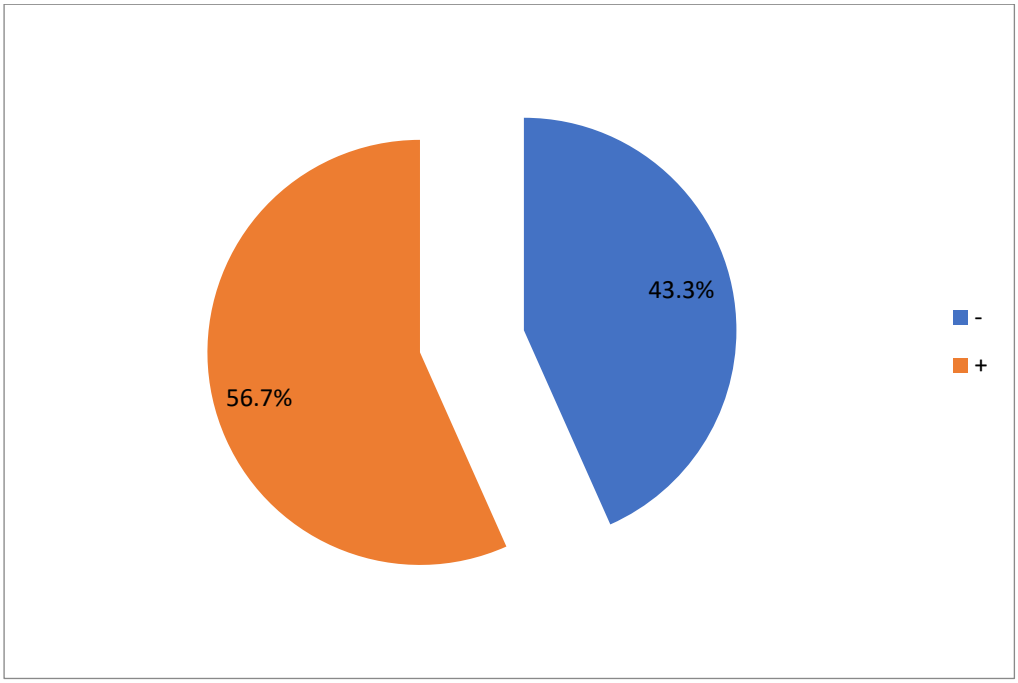
Post Nasal drip	No. of cases	Percentage
Absent	26	43.3%
Present	34	56.7%

N= total number of patients with %=percentage of patients post nasal drip

Out of 60 cases, post nasal drip was seen in 34(56.7%).

Fig X

Post nasal drip



Post Nasal Drip Was Seen In 34(56.7%)

Table XI

Duration of post nasal drip

N=34

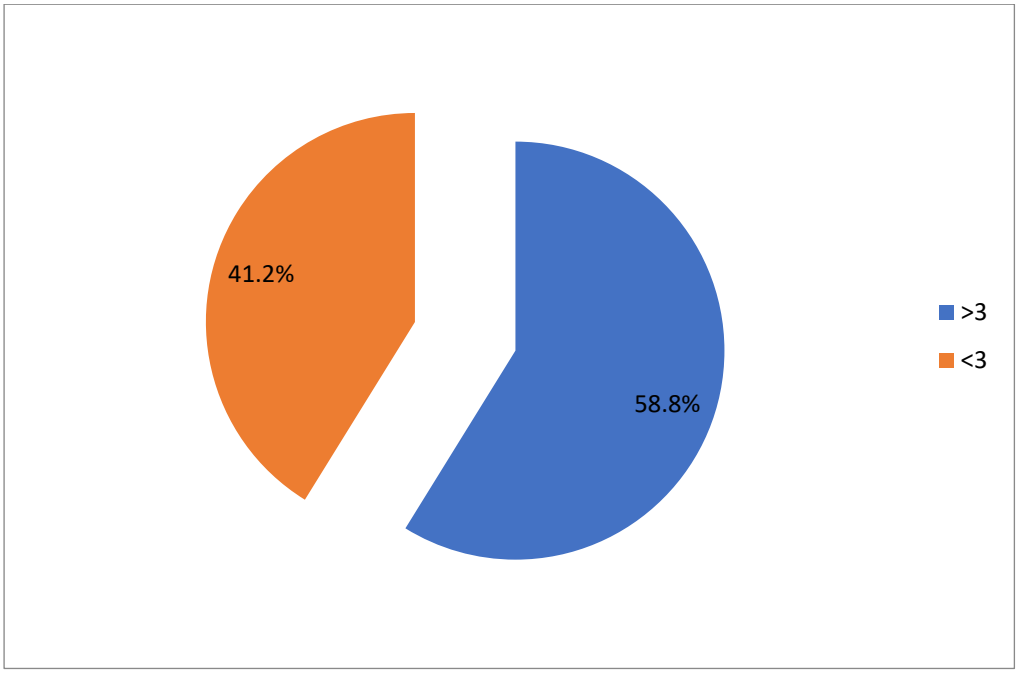
Post Nasal drip Duration	No of patients	Percentage of patients
>3 month	20	58.8%
<3 month	14	41.2%

N= total number of patients %=percentage of patients

Out of 34 patients who had post nasal drip, in majority (58.8%) the duration was more than 3 months.

FIG XI

Duration of post nasal drip



In majority (58.8%) the duration was more than 3 months.

Table XII

Frontal Headache

N= 60

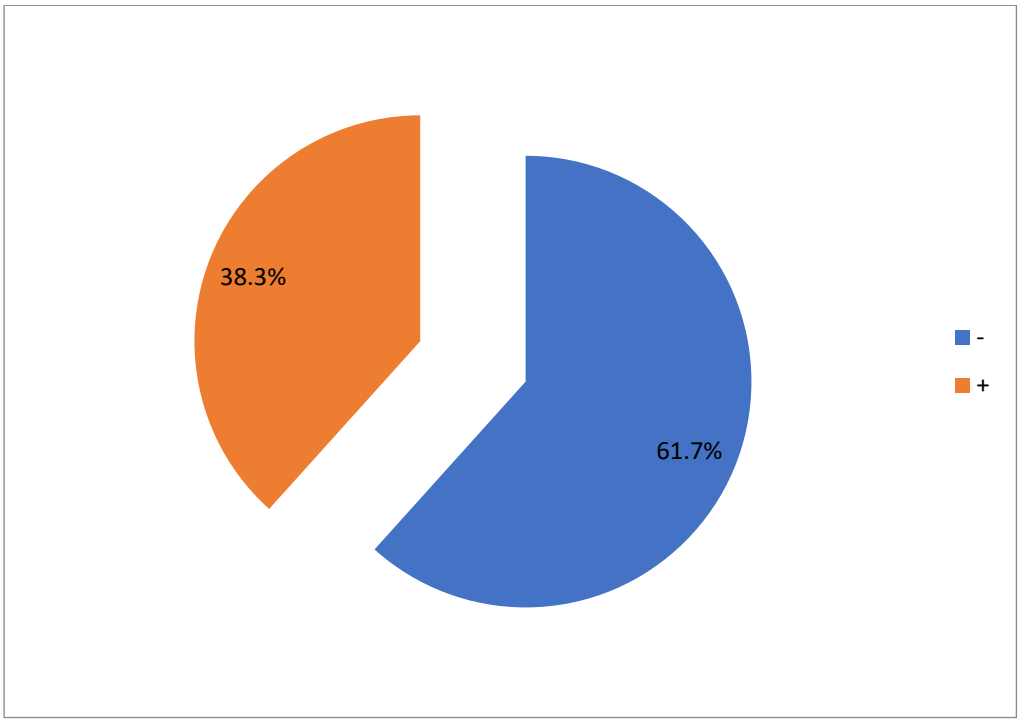
Frontal Headache	No. of cases	Percentage
Absent	37	61.7%
Present	23	38.3%

N= total number of patients %=percentage of patients

In our study out of 60 patients, frontal headache was seen in only 23 patients (38.3%).

Fig XII

Frontal headache



Frontal headache was seen in only 23 patients (38.3%).

Table XIII

Duration of frontal headache

N= 23

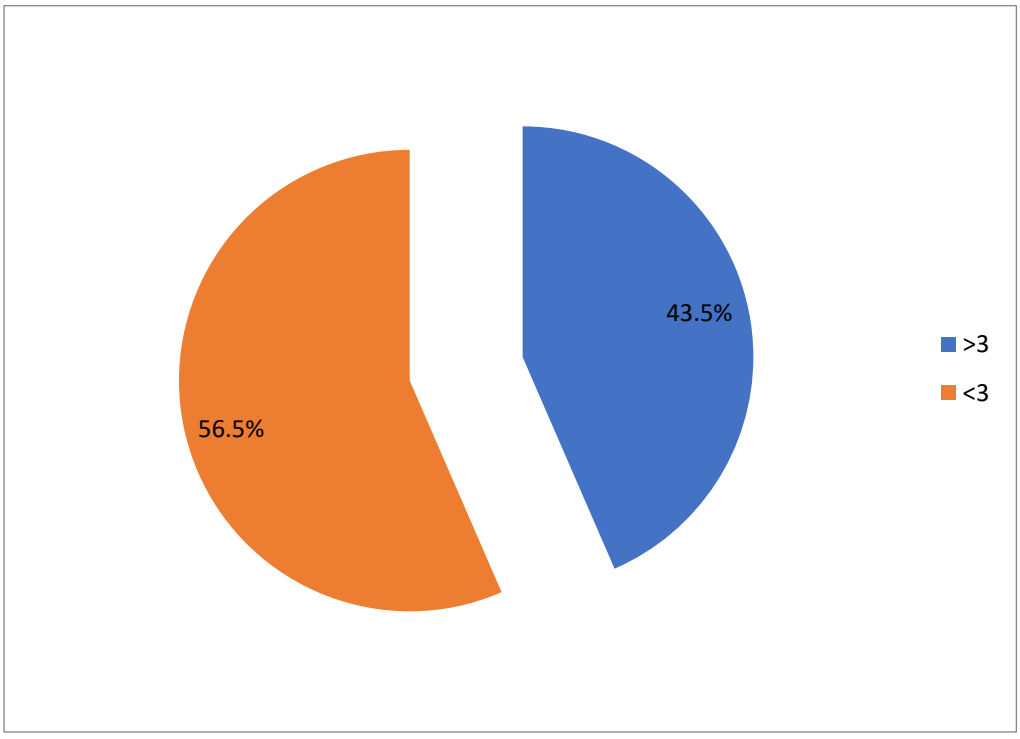
Frontal Headache Duration	No of patients	Percentage of patients
>3 months	10	43.5%
<3 months	13	56.5%

N= total number of patients with frontal headache%=percentage of patients

Out of 23 patients who had frontal headache, maximum 13 (56.5%) had duration less than 3 months.

FIG XIII

Duration of frontal headache



Maximum 13 (56.5%) had duration less than 3 months.

TABLE XIV

Epistaxis

N=60

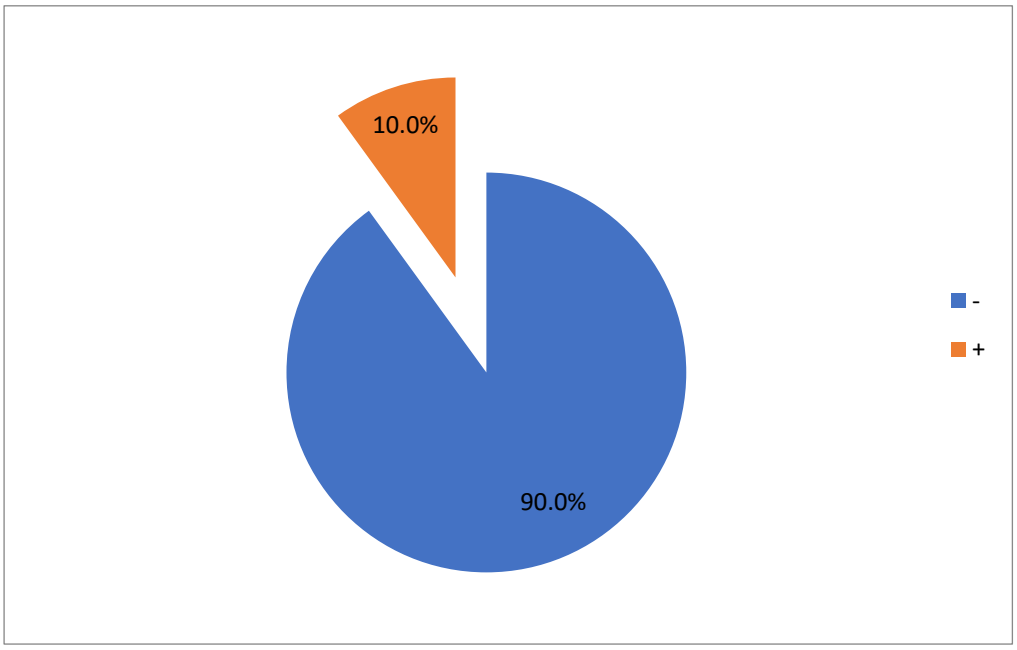
Epistaxis	No. of cases	Percentage
Absent	54	90.0%
Present	6	10.0%

N= total number of patients with frontal headache %=percentage of patients

In our study, out of 60 patient epistaxis was seen in only 6 patients (10%).

FIG XIV

Epistaxis whether present or absent



Epistaxis was seen in only 6 patients (10%).

TABLE XV

Duration of epistaxis

N= 6

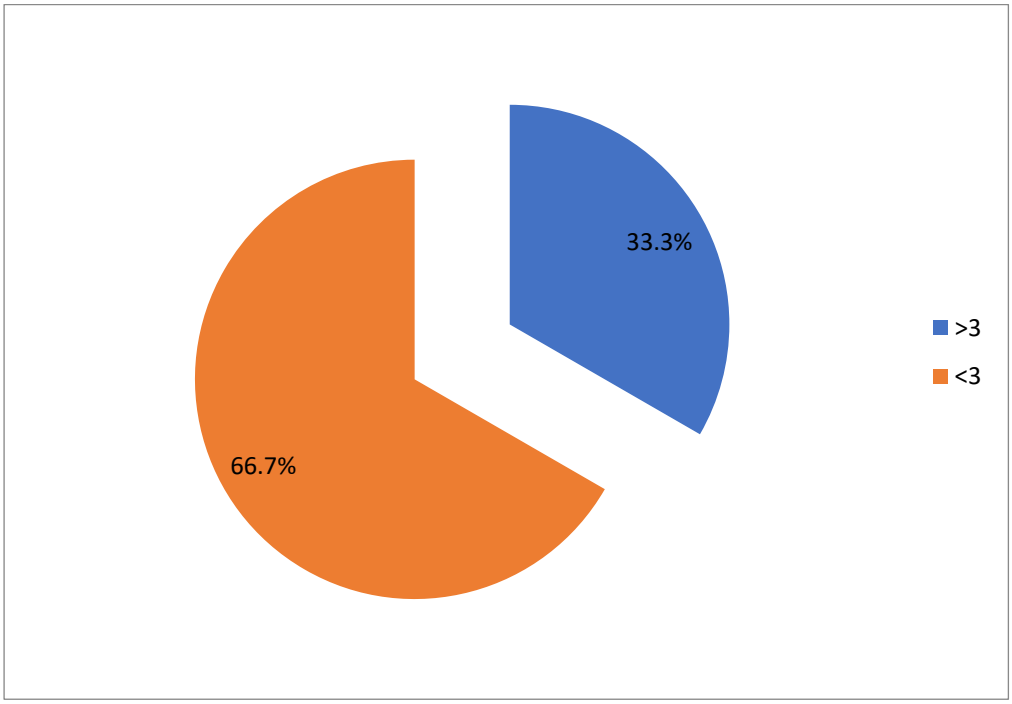
Epistaxis Duration	No of patients	Percentage
>3 months	2	33.3%
<3 months	4	66.7%

N= total number of patients with epistaxis %=percentage of patient

Out of 6 patients who had epistaxis, two-third had duration of less than 3 months.

Fig XV

Duration of epistaxis



Patient who had epistaxis, two-third of patient's duration was less than 3 months.

TABLE XVI

Nasal Obstruction

N=60

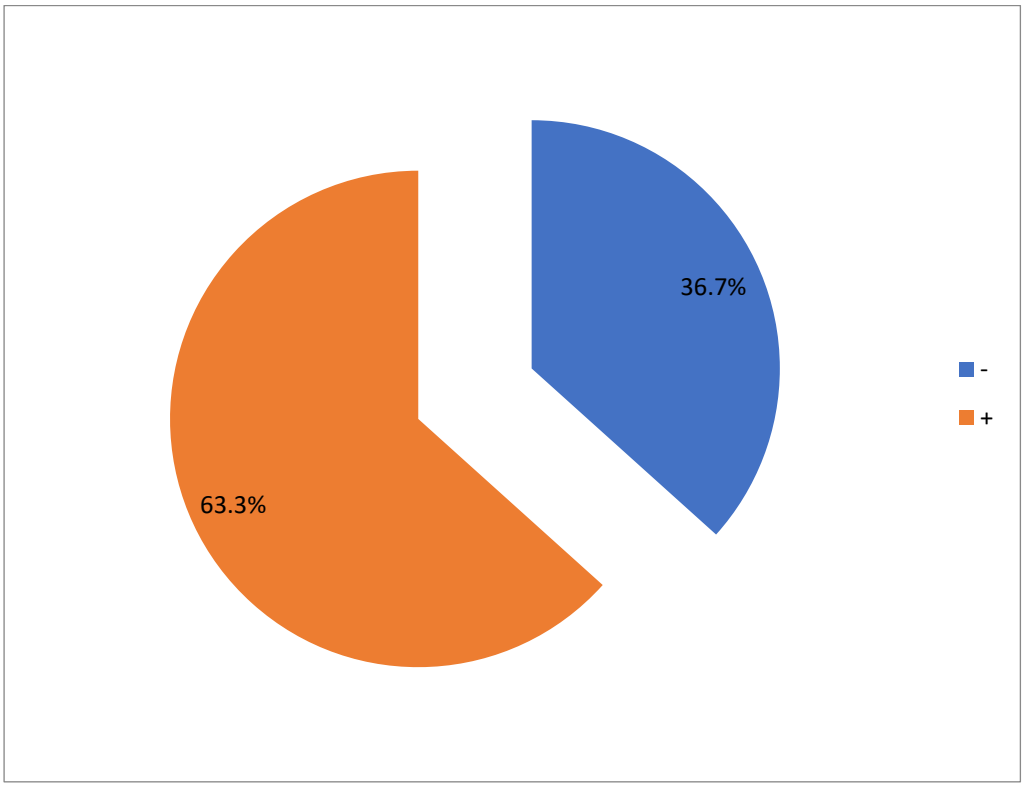
Nasal Obstruction	No. of cases	Percentage
Absent	22	36.7%
Present	38	63.3%

N= total number of patients with nasal obstruction %=percentage of patients

In our study, nasal obstruction was seen in 38 patients (63.3%) out of total of 60 patients.

FIG XVI

Nasal obstruction



Nasal obstruction was seen in 38 patients (63.3%)

Table XVII

Duration of nasal obstruction

N= 38

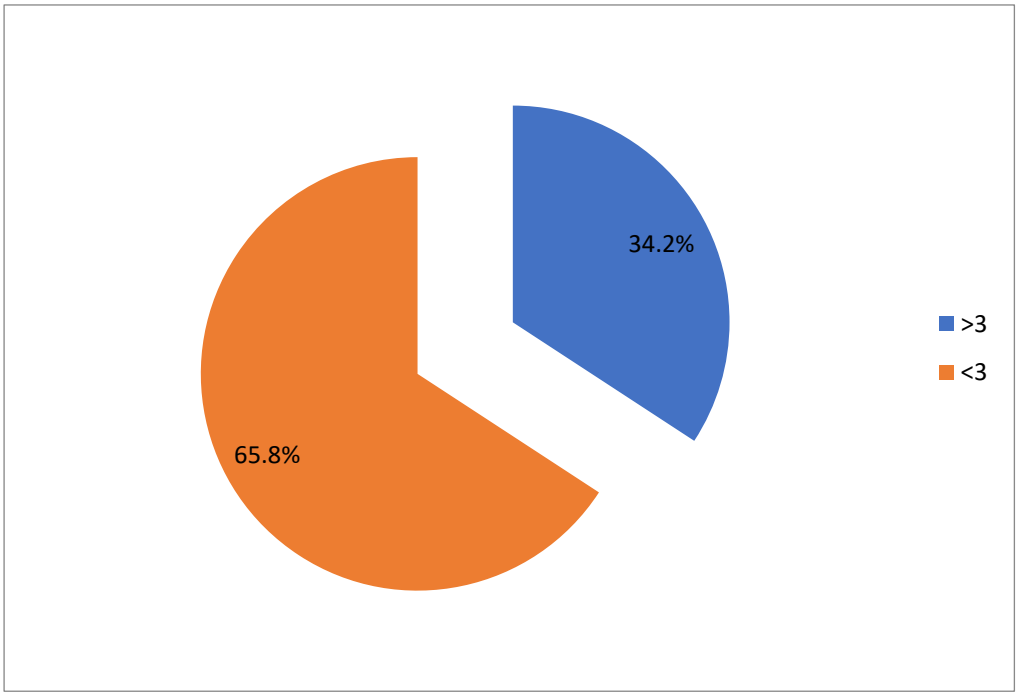
Nasal Obstruction Duration	No of patients	Percentage
>3 months	13	34.2%
<3 months	25	65.8%

N= total number of patients with nasal obstruction %=percentage of patients

Out of 38 patients in whom nasal obstruction was seen, maximum (65.5%) had duration of less than 3 months.

Fig XVII

Duration of nasal obstruction



Out of 38 patients in whom nasal obstruction was seen, maximum (65.5%) had duration of less than 3 months

TABLE XVIII

Associated comorbidities

N= 41

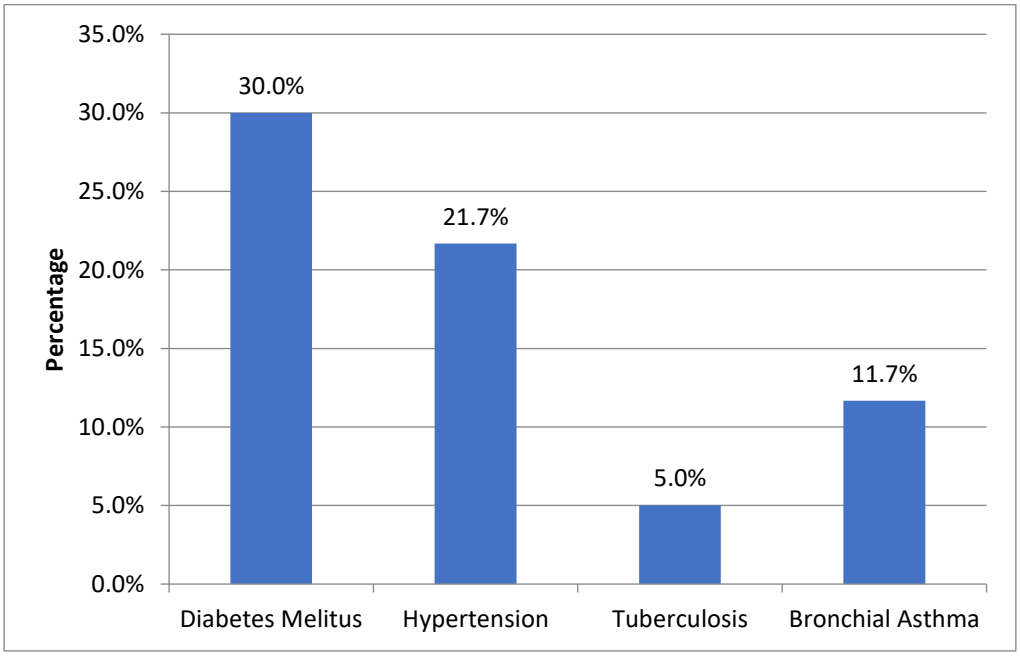
Associated comorbidities	No. of cases	Percentage
Diabetes Melitus	18	30.0%
Hypertension	13	21.7%
Tuberculosis	3	5.0%
Bronchial Asthma	7	11.7%

N= total number of patients with comorbidities %=percentage of patients

In our study out of 60 patients, 18 patients had diabetes mellitus, 13 patients were hypertensive, 3 had tuberculosis and 7 had bronchial asthma.

Fig XVIII

Associated comorbidities



Majority of patients 18patients (30%) had diabetes mellitus as associated comorbidity followed by hypertension 13 (21.7%)

Table XIX

Addictions if present

N=60

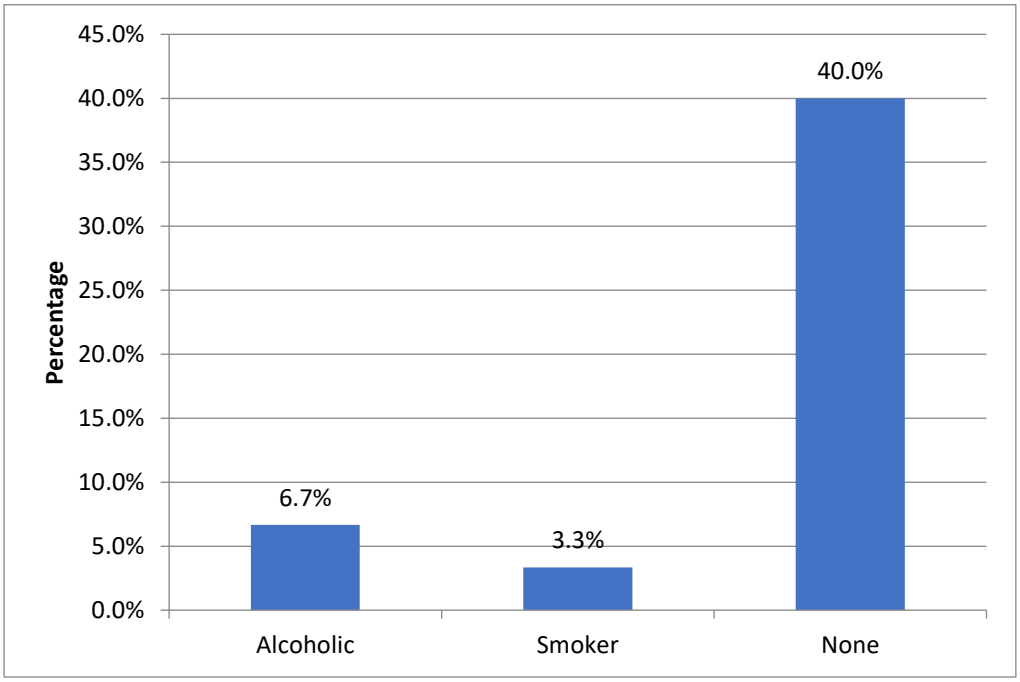
Addictions	No of cases	Percentage
Alcoholic	8	6.7%
Smoker	4	3.3%
None	48	40.0%

N= total number of patients %=percentage of patients

In our study out of 60 patients, only 8patients (6.7%) consumed alcohol and 4patients (3.3%) were smokers.

Fig XIX

Addictions



Only 8 patients (6.7%) consumed alcohol and 4 patients (3.3%) were smokers.

Table XX

Findings on anterior rhinoscopy

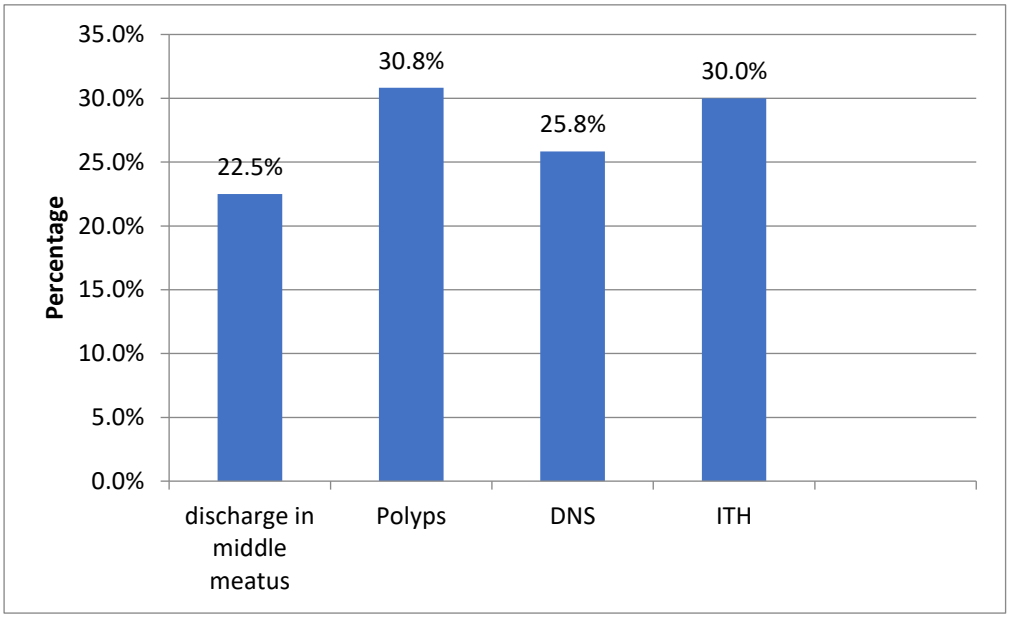
Anterior rhinoscopy	No. of cases	Percentage
Discharge in middle meatus	14	22.5%
Polyps	19	30.8%
Deviated nasal septum	16	25.8%
Inferior turbinate hypertrophy	18	30.0%

%=percentage of patients

In our study, out of a total of 60 patients, discharge in middle meatus was seen in 14patients (22.5%), polyps in 19patients (30.8%), deviated nasal septum in 16patients (25.8%), inferior turbinate hypertrophy in 18patients (30%)

FIG XX

Findings on anterior rhinoscopy



Polypi were noticed in maximum number of patients 19 patients (30.8%) followed by ith (inferior turbinate hypertrophy) seen in 18 patients (30%)

C) Endoscopic profile

TABLE XXI

Diagnostic nasal endoscopy

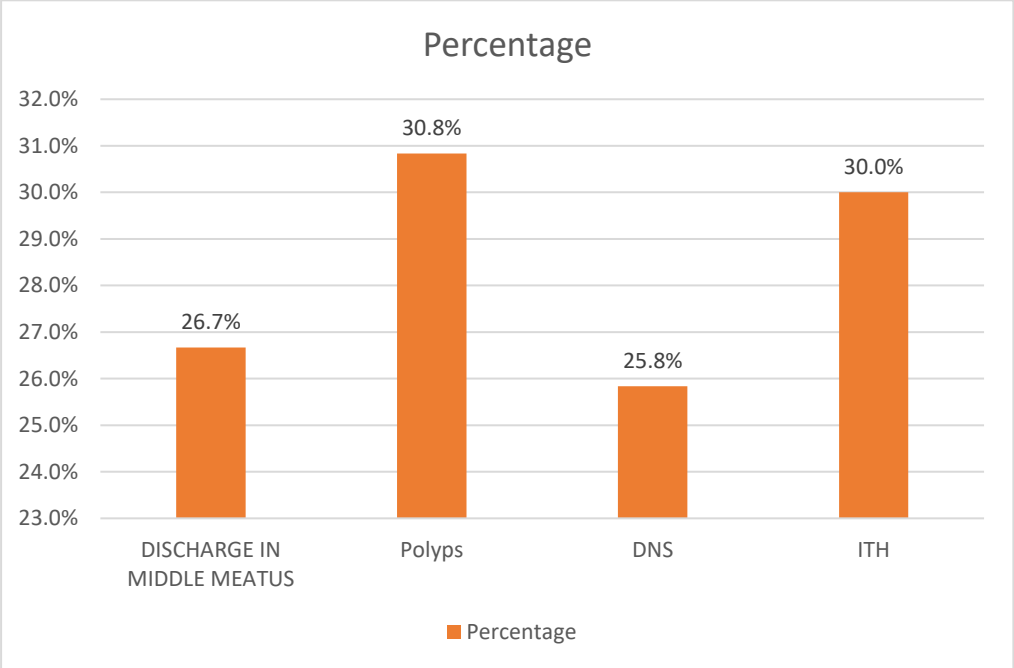
Diagnostic nasal endoscopy	No. of cases	Percentage
Discharge in middle meatus	16	26.7%
Polyps	19	30.8%
Deviated nasal septum	16	25.8%
Inferior turbinate hypertrophy	18	30.0%

N= total number of patients %=percentage of patients

On diagnostic nasal endoscopy majority of cases had polyps 19 (30.8%) in nasal cavity followed by inferior turbinate hypertrophy 18 (30%)

FIG XXI

Diagnostic nasal endoscopy



Majority of cases had polyps 19 (30.8%) on diagnostic nasal endoscopy

Table XXII

Discharge in middle meatus

N=16

Discharge	No. of cases	Percentage
Mucoid	10	62.5%
Mucopurulent	6	37.5%

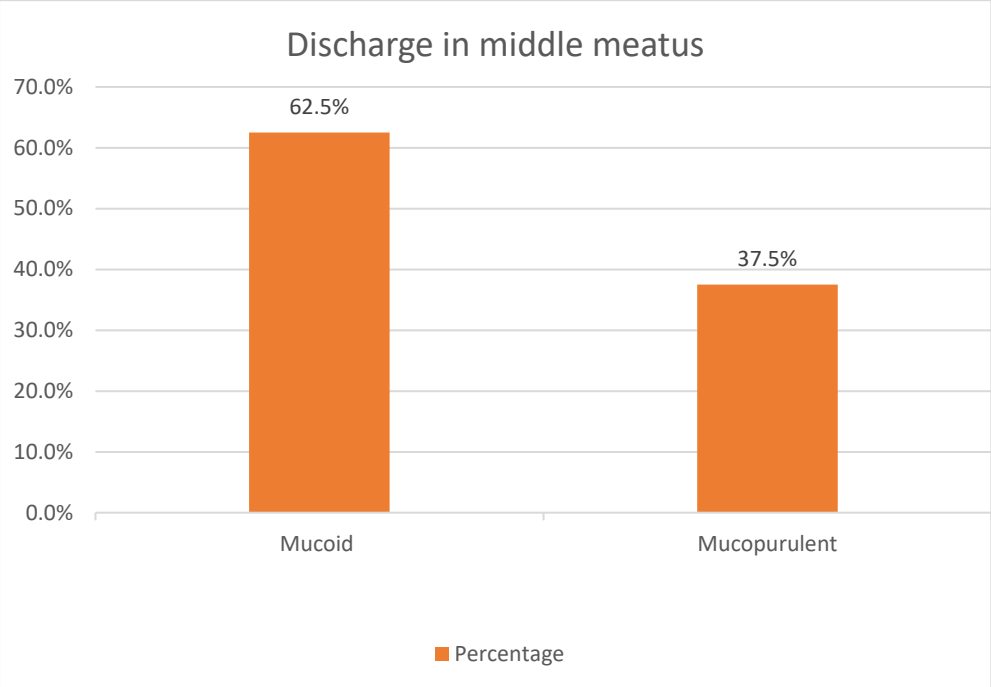
N= total number of patients with discharge in middle meatus

%=percentage of patients

In our study discharge was seen in 16 cases in middle meatus with mucoid in majority of cases 10(37.5%)

Fig XXII

Discharge in middle meatus



Majority of patients had mucoid discharge in middle meatus10(62.5%)

Table XXIII

Discharge in nasopharynx

N= 32

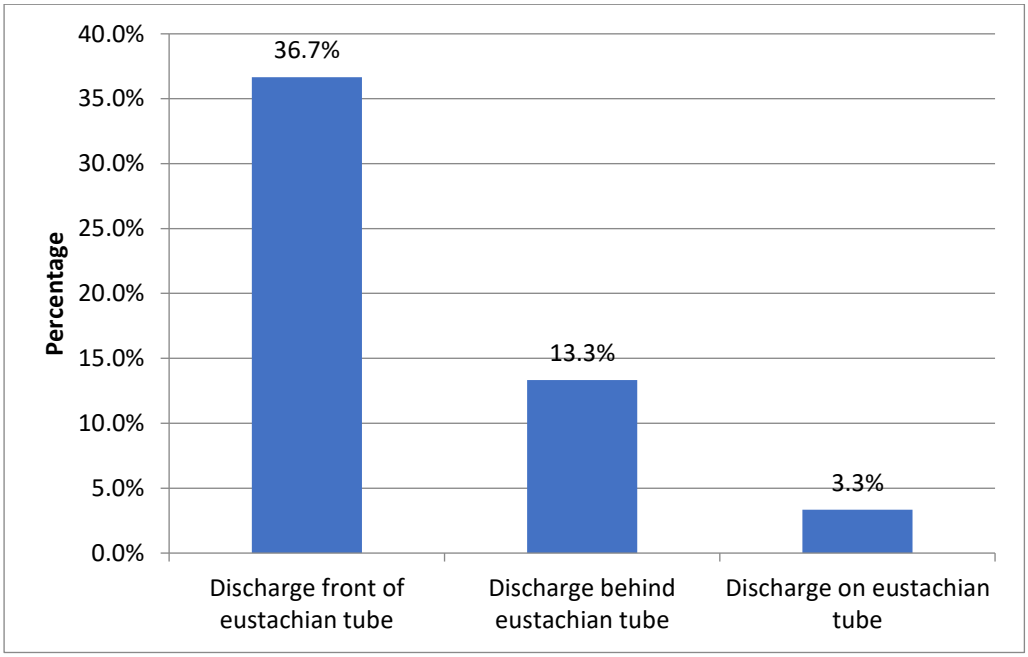
Discharge in nasopharynx	No. of cases	Percentage
Discharge front of eustachian tube	22	36.7%
Discharge behind eustachian tube	8	13.3%
Discharge on Eustachian tube	2	3.3%

N= total number of patients with discharge in nasopharynx
%=percentage of patients

In our study, maximum number of patients had discharge in nasopharynx, Discharge was in front of eustachian tube in 22(36.7%), discharge behind eustachian tube was in 08 (13.3%) and in only 2 (3.3%) over eustachian tube.

FIG XXIII

Discharge in nasopharynx



Most of patients who had discharge in nasopharynx majority had discharge in front of Eustachian tube 22(36.7 %)

D) Radiological profile

TABLE XXIV

Computed tomography findings

CT/MRI	No. of cases	Percentage
Deviated nasal septum	16	25.8%
Inferior turbinate hypertrophy	18	30.0%
Mucosal hypertrophy	21	35.0%
Sino nasal polyposis	26	43.3%
Pansinusitis	31	51.7%
Mucocele	4	6.7%

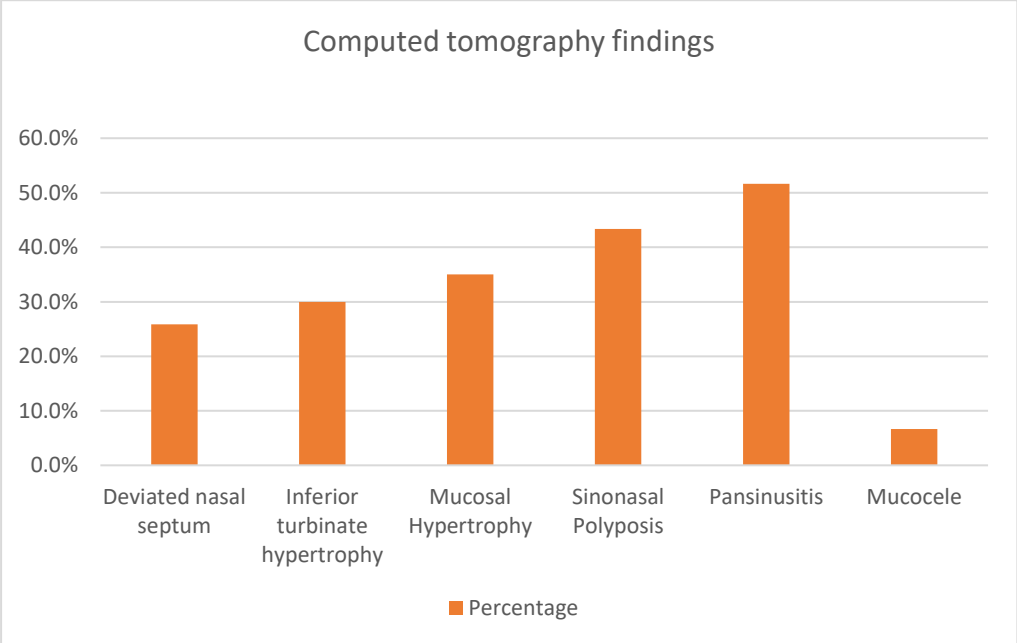
N= total number of patients with discharge in nasopharynx

%=percentage of patients

In our study maximum patients had pansinusitis 31(51.7) followed by Sino nasal polyposis 26 (43.3%)

Fig XXIV

Computed tomography findings



Majority of cases 31(51.7 %) had pansinusitis followed by sino nasal polyposis 26 (43.3%)

E) Post operative results

Table XXV

Endoscopic axillary technique

N= 60

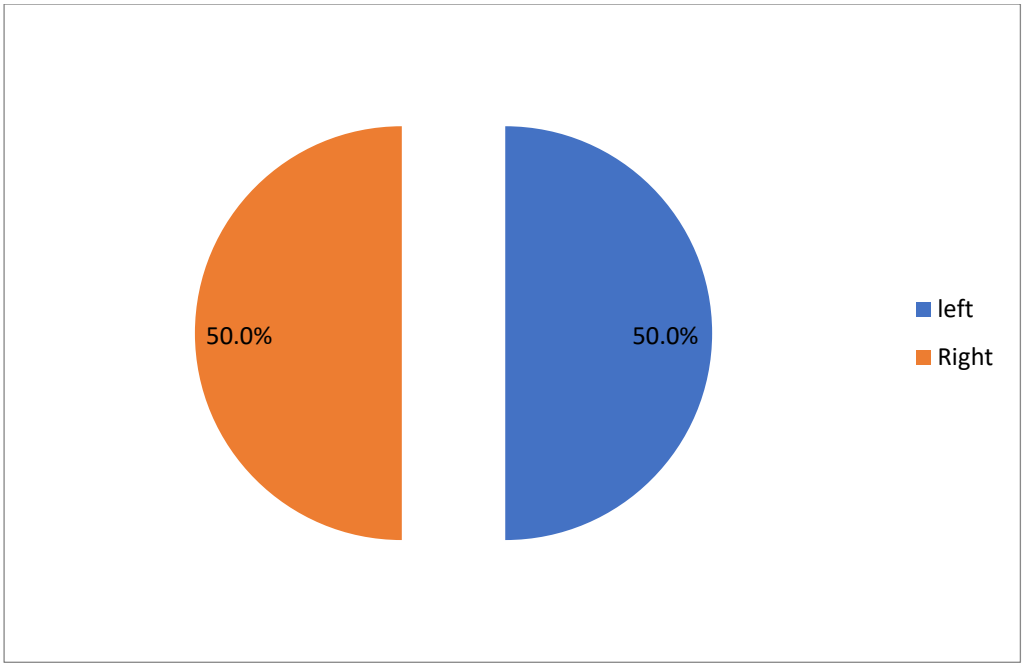
Axillary flap approach	No. of cases	Percentage
Left nasal cavity	30	50.0%
Right nasal cavity	30	50.0%

N= total number of patients %=percentage of patients

In our study, equal number of cases were taken of the two sides i.e. in first set 30 right side was operated using axillary flap and the next 30 left was operated using axillary flap approach

FIG XXV

Axillary approach



In our study, equal number of cases were taken of the two sides i.e. in first set 30 right side was operated using axillary flap and in the next set 30 left was operated using axillary flap approach

TABLE XXVI

Endoscopic Conventional approach

N=60

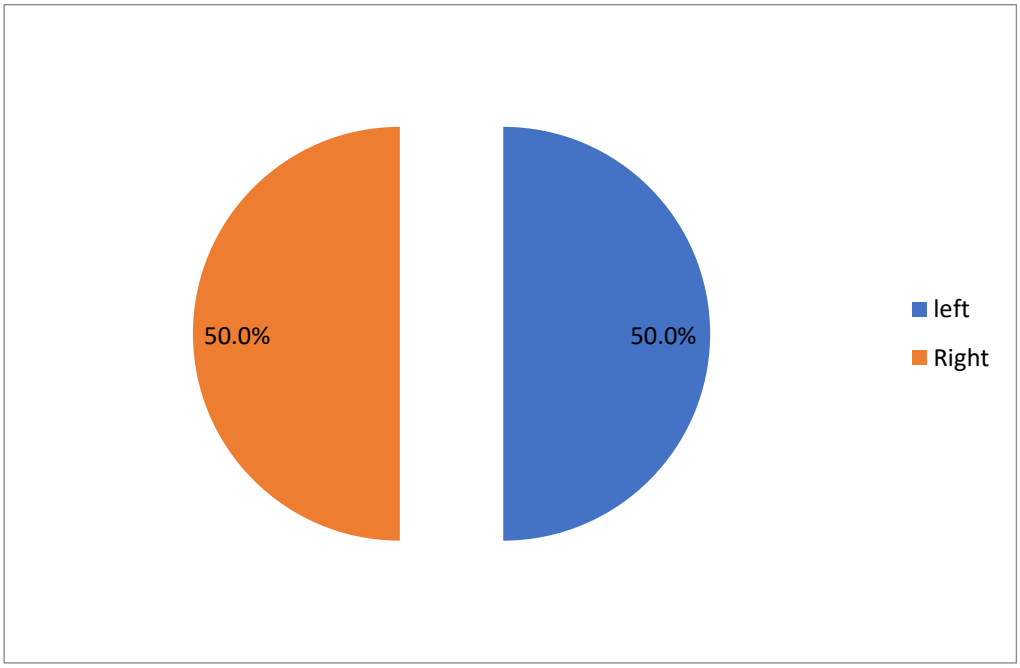
Conventional approach	No. of cases	Percentage
Left nasal cavity	30	50.0%
Right nasal cavity	30	50.0%

N= total number of patients %=percentage of patients

In our study, equal number of cases were taken of the two sides i.e. in first set 30 left side was operated using conventional approach and the next 30 right side was operated using conventional

Fig XXVI

Endoscopic Conventional approach



In our study, equal number of cases were taken of the two sides i.e. in first set 30 left side was operated using conventional approach and the next 30 right side was operated using conventional

TABLE XXVII

Endoscopy at 1st month post op

ENDOSCOPY 1 M		Axillary approach		Conventional approach		Total	Chi-square value	p-value
		No. of sides	%age	No. of sides	%age			
Ostium measurement (in mm)	2	1	2%	25	42%	26	71.687	0.0001
	4	9	15%	30	50%	39		
	6	26	43%	5	8%	31		
	8	24	40%	0	0%	24		

M=month mm=millimetre

TABLE XXVIII

Mean ostium measurement at 1st month endoscopy post op

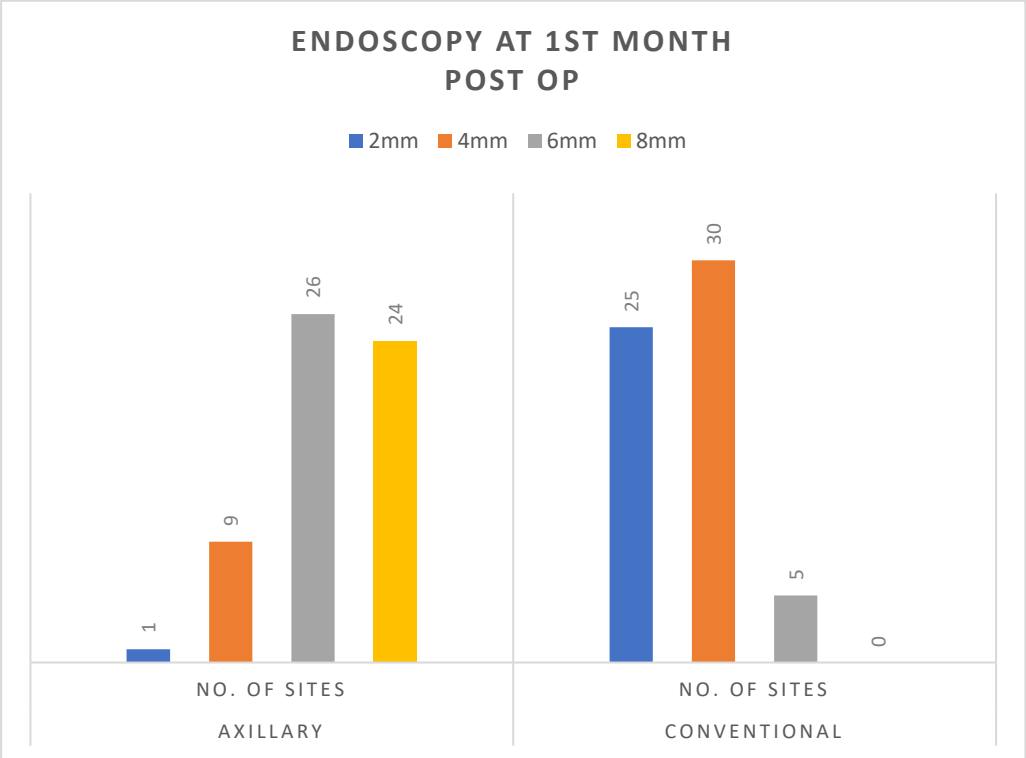
	Axillary approach		Conventional approach		t	p-value
	Mean	SD	Mean	SD		
ENDOSCOPY 1 M	6.43	1.52	3.33	1.26	12.160	0.000

M=month mm=millimetre

During follow-up evaluation by endoscopy at 1st month, the size of frontal sinus ostium operated by axillary flap approach is larger as compared to conventional approach with statistical difference between both the group (p value= 0.0001).The mean value of ostia after axillary approach was6.43 mm and via conventional was 3.33mm

FIG XXVII

Endoscopy at 1st month post op



Majority of sides operated by axillary flap approach 26 (43%) have ostia of 6mm on 1 month follow-up endoscopy as compared to conventional, in which majority of sides 30 (50%) have ostia of 4mm on 1st month follow-up endoscopy.

TABLE XXIX

Endoscopy at 3rd month

ENDOSCOPY3M		**Axillary approach**		**Conventional approach**		**Total**	**Chi-square value**	**p-value**
		No. of sides	%age	No. of sides	%age			
ostium measurement (in mm)	0	0	0%	9	15%	9	72.254	0.0001
	2	1	2%	30	50%	31		
	4	20	33%	20	33%	40		
	6	31	52%	1	2%	32		
	8	8	13%	0	0%	8		

M=month mm=millimetre

TABLE XXX

Mean ostium measurement at 3rd month endoscopy

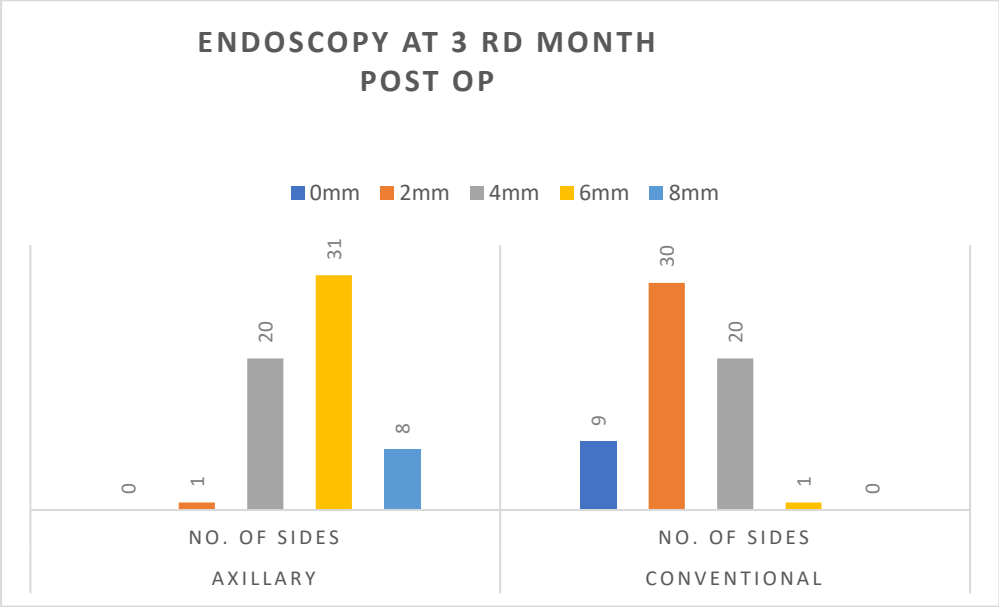
	Axillary approach		Conventional approach		t	p-value
	Mean	SD	Mean	SD		
ENDOSCOPY3M	5.53	1.40	2.43	1.43	12.015	0.000

M=month mm=millimetre

During follow-up evaluation by endoscopy at 3rd month, the size of frontal sinus ostia operated by axillary flap approach is more as compared to conventional approach with statistically difference between both the group (p value= 0.0001). The mean value of ostia after axillary approach was5.53 mm and via conventional was 2.43mm

FIG XXVIII

Endoscopy at 3 rd. month post op



Majority of sides operated by axillary flap approach 31 (52%) have ostia of 6mm on 3rd month follow-up endoscopy as compared to conventional in which majority of sides 30 (50%) have ostia of 2mm on 3rd month follow-up endoscopy.

TABLE XXXI

Endoscopy at 6th month

ENDOSCOPY6M		**Axillary approach**		**Conventional approach**		**Total**	**Chi-square value**	**p-value**
		No. of sides	**%age**	**No. of sides**	**%age**			
Ostium measurement (in mm)	0	4	7%	19	32%	23	64.649	0.0001
	2	2	3%	28	47%	30		
	4	26	43%	13	22%	39		
	6	23	38%	0	0%	23		
	8	5	8%	0	0%	5		

M=month mm=millimetre

TABLE XXXII

Mean ostium measurement at 6th month endoscopy

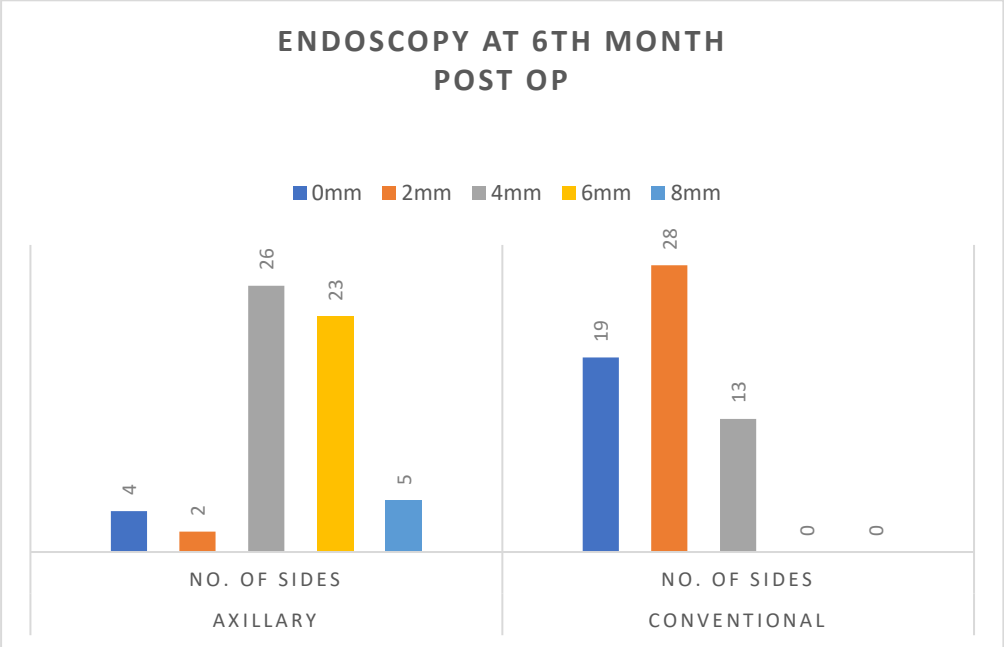
M=month mm=millimetre

	Axillary approach		Conventional approach		t	p-value
	Mean	SD	Mean	SD		
ENDOSCOPY6M	4.77	1.88	1.80	1.46	9.653	0.000

During follow-up evaluation by endoscopy at 6th month, the size of frontal sinus ostium operated by axillary flap approach is larger as compared to conventional approach with statistical difference between both the group (p value= 0.0000). The mean value of ostia after axillary approach was 4.77 mm and via conventional was 1.80 mm

FIG XXIX

Endoscopy at 6th month post op



Majority of sides operated by Axillary flap approach 26 (43%) have ostia of 6mm on 1 month follow-up endoscopy as compared to conventional in which majority of sides 28 (47%) have ostia of 2mm on 3rd month follow-up endoscopy.

TABLE XXXIII

Edema in post op period

		Axillary approach		Conventional Approach		Total	Chi-square value	p-value
		No. of sides	%age	No. of sides	%age			
Edema1m	-	49	82%	48	80%	97	0.054	0.817
	+	11	18%	12	20%	23		
Edema3m	-	60	100%	60	100%	120		
Edema6m	-	58	97%	58	97%	116	0.000	1.000
	+	2	3%	2	3%	4		

M=month

During follow-up evaluation by endoscopy on 1st month, the edema in sides operated by axillary flap approach is more as compared to conventional approach but no statistical difference between both the group (p value= 0.817).

At 3rd month, edema was not found in any side so both the approaches can't be compared.

At6th month, equal number of cases with edema, but no statistical difference between both the groups (p value= 1.000).

FIG XXX

Edema in post op period

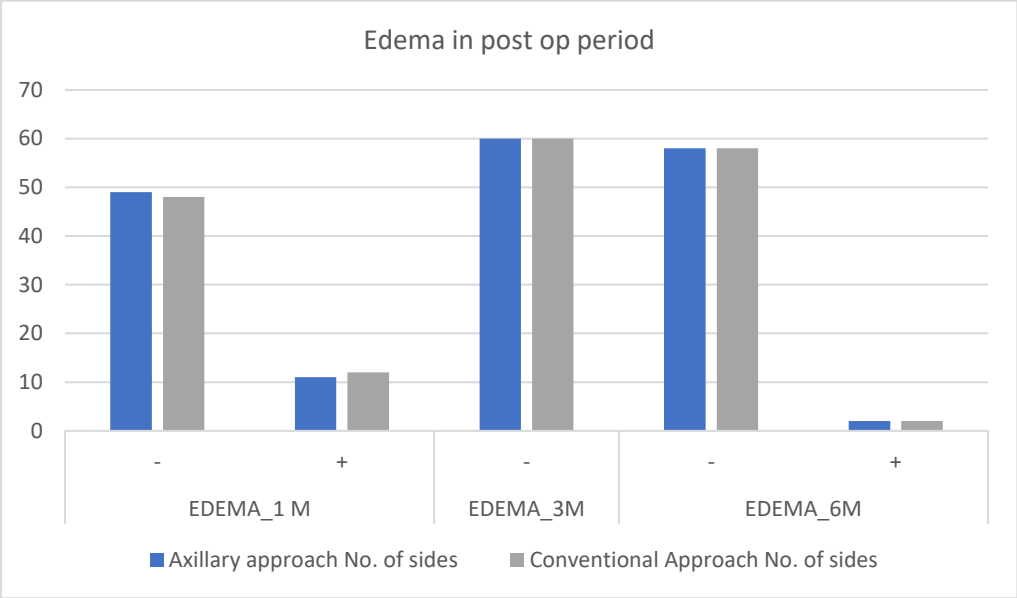


TABLE XXXIV

Neosteogenesis

M=month

		Axillary approach		Conventional approach		Total
		No. of sides	%age	No. of sides	%age	
Neo osteogenisis 1 m	-	60	100%	60	100%	120
	+	0	0%	0	0%	0
Neo osteogenisis 3m	-	60	100%	60	100%	120
	+	0	0%	0	0%	0
Neo osteogenisis 6m	-	60	100%	60	100%	120
	+	0	0%	0	0%	0

During follow-up evaluation by endoscopy at 1st month, 3RD month and 6-month neoosteogenesis was not found in both the techniques

FIG XXXI

Neosteogenesis

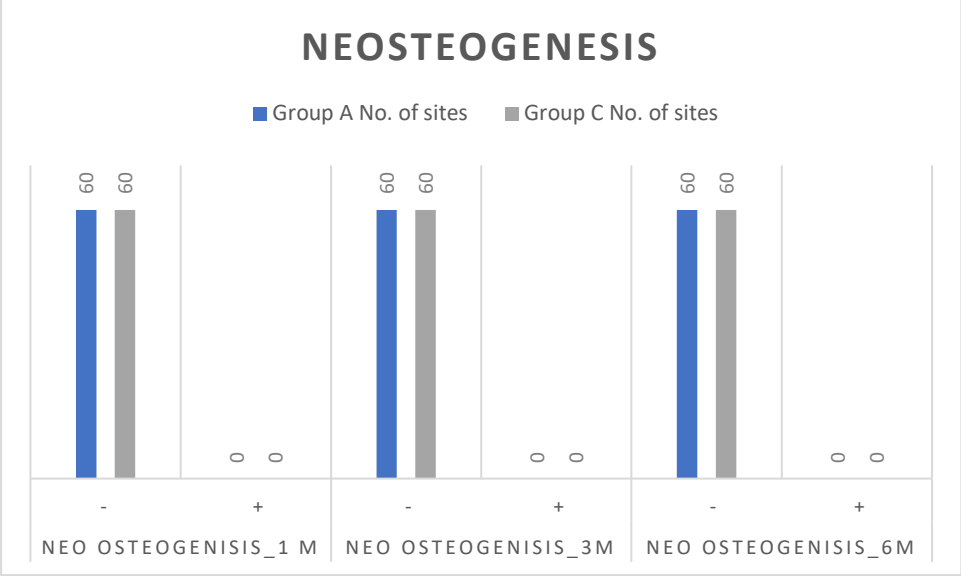


Table XXXV

Polypi on monthly follow up

		Axillary approach		Conventional approach		Total	Chi-square value	p-value
		No. of sides	%age	No. of sides	%age			
Polypi 1m	-	57	95%	56	93%	113	0.152	0.697
	+	3	5%	4	7%	7		
Polypi 3m	-	58	97%	51	85%	109	4.904	0.053
	+	2	3%	9	15%	11		
Polypi 6m	-	56	93%	39	65%	95	14.602	0.000
	+	4	7%	21	35%	25		

M=month mm=millimetre

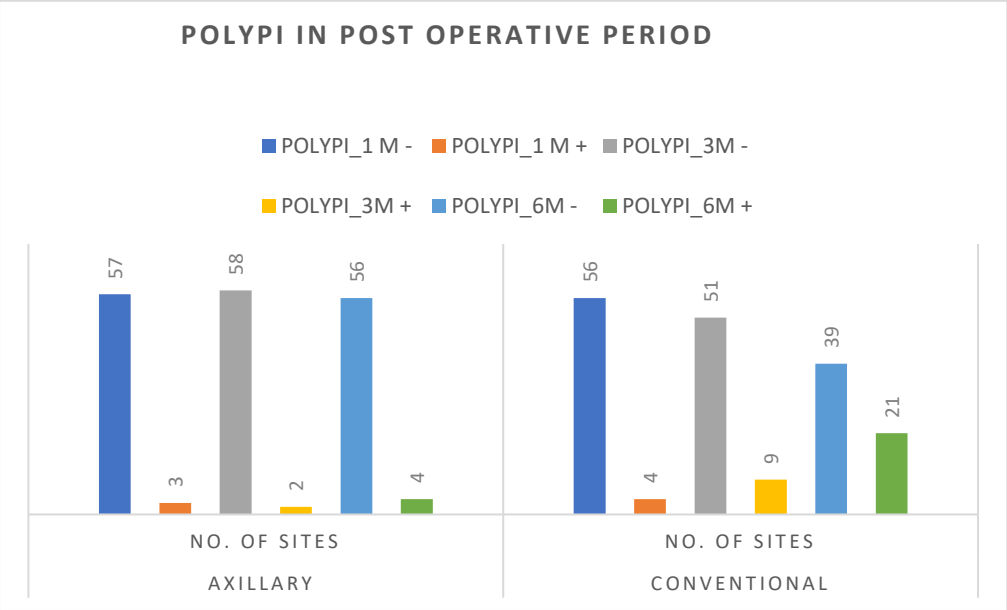
During follow-up evaluation by endoscopy at 1st month, polypi noticed in sides operated by axillary flap approach were less as compared to conventional approach but no statistically difference between both the group (p value= 0.697).

At 3rd month, polypi were noticed in both the techniques but they are not statistically significant (p value=0.053).

In 6th month, more polypi were noticed in sides operated by conventional approach as compared to by axillary flap approach and is statistically significant (p value= 0.000).

Fig XXXII

Polypi in post operative period



At 6th month, more polyps were found in sides operated by conventional approach 21 (35%) as compared to by axillary flap approach 4 (7%)

TABLE XXXVI

Frontal recess webbing in post operative period

		Axillary approach		Conventional approach		Total	Chi-square value	p-value
		No. of sides	%age	No. of sides	%age			
Webbing 1m	-	52	87%	56	93%	108	1.481	0.224
	+	8	13%	4	7%	12		
Webbing 3m	-	45	75%	53	88%	98	3.562	0.097
	+	15	25%	7	12%	22		
Webbing 6m	-	38	63%	49	82%	87	5.057	0.040
	+	22	37%	11	18%	33		
Total		60	100%	60	100%	120		

M= month

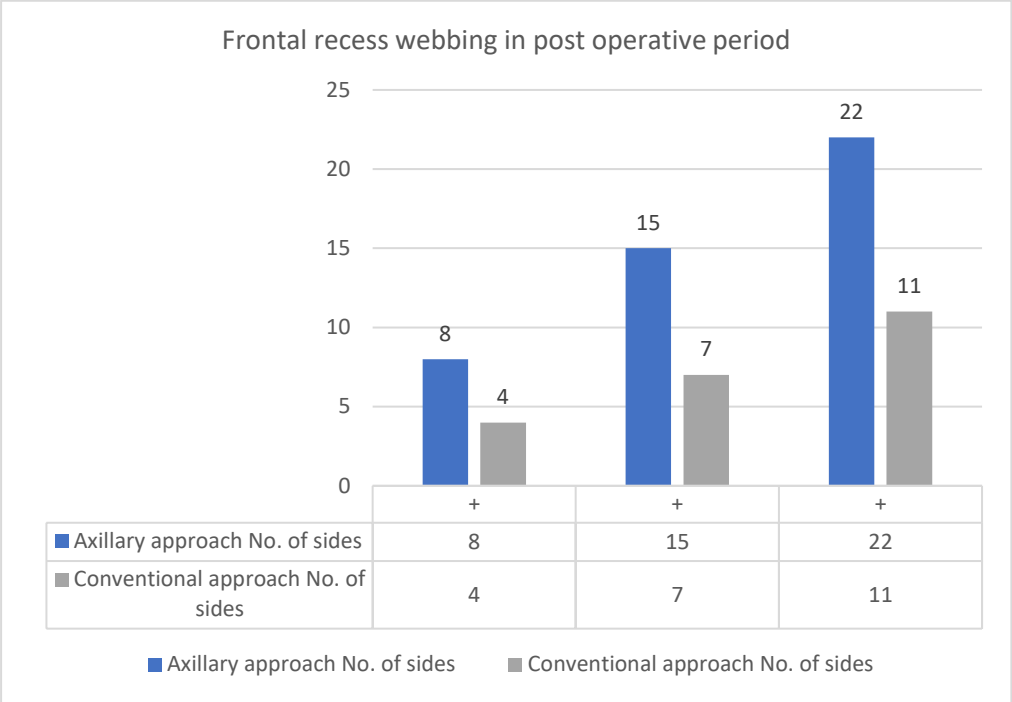
During follow-up evaluation by endoscopy at 1st month, webbing was seen in sides operated by axillary flap approach is more as compared to conventional approach but no statistical difference between both the groups (p value= 0.224).

At 3rd month, webbing was more in axillary approach than conventional approach but they are not statistically significant (p value=0.097).

At 6thmonth, webbing was found more in sides operated by axillary flap approach as compared to by conventional approach and is statistically significant (p value= 0.040).

Fig XXXIII

Frontal recess webbing in post operative period



During follow-up evaluation by endoscopy at 1st month, webbing was seen in sides operated by axillary flap approach more as compared to conventional approach but no statistical difference between both the groups (p value= 0.224).

At 3rd month, webbing was more in axillary approach than conventional approach but they are not statistically significant (p value=0.097).

At 6th month, more webbing was found in sides operated by axillary flap approach as compared to by conventional approach and is statistically significant (p value= 0.040).

Table XXXVII

Residual symptoms

Residual symptoms		Axillary approach		Conventional approach		Total	Chi-square value	p-value
		Axillary Sides	%age	Conventional Sides	%age			
Residual symptoms 1m	-	60	100%	58	97%	118	2.034	0.496
	+	0	0%	2	3%	2		
Residual symptoms 3m	-	59	98%	56	93%	115	1.878	0.364
	+	1	2%	4	7%	5		
Residual symptoms 6m	-	58	97%	50	83%	108	5.926	0.029
	+	2	3%	10	17%	12		
Total		60	100%	60	100%	120		

M= month

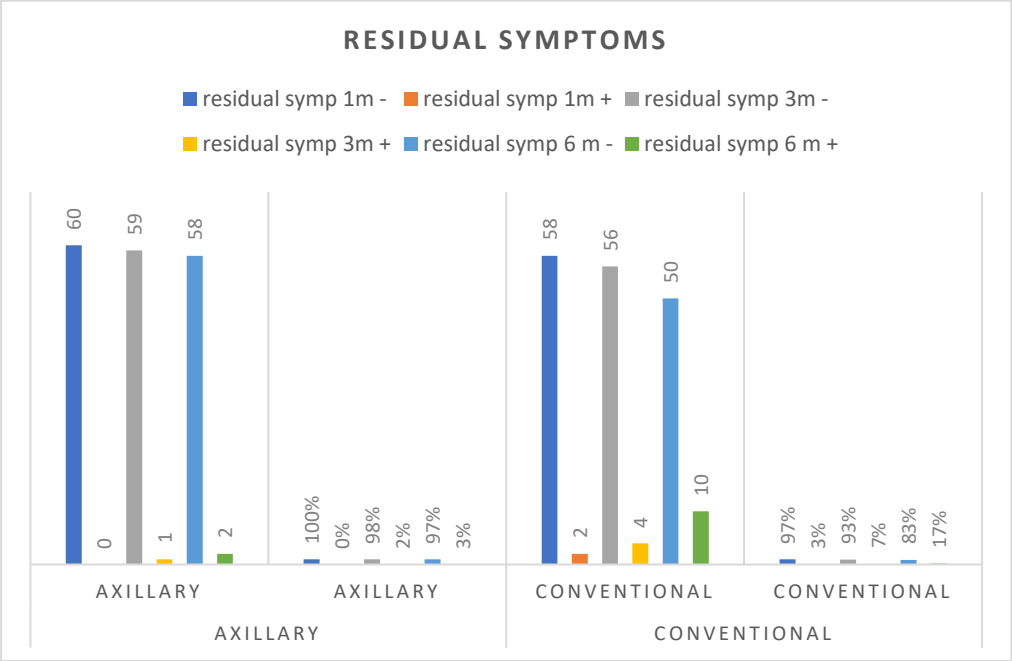
During follow-up residual symptoms like headache and nasal blockage in sides operated by axillary flap approach are less as compared to conventional approach but there was no statistical difference between both the groups (p value= 0.496).

At 3rd month we found that residual symptoms like headache and nasal blockage in sides operated by axillary flap approach are less as compared to conventional approach but there was no statistical difference between both the groups (p value= 0.364)

At 6th month, we found that residual symptoms like headache and nasal blockage in sides operated by axillary flap approach are less as compared to conventional approach with statistically difference between both the groups (p value= 0.029)

Fig XXXIV

Residual symptoms



At 6th month, residual symptoms were found in sides operated by conventional approach 10(17%) were more as compared to by axillary flap approach 2 (3%)

Part II: CADAVERIC STUDY

Observation tables of cadaveric study

Table XXXVIII

To study distance of frontal ostium from the anterior nasal spine

(n=10)

NS-FO (in cms)	No. of cadavers	%age
5-5.5	3	30.0
5.6-6	6	60.0
6.1-6.5	1	10.0
Total	10	100.0

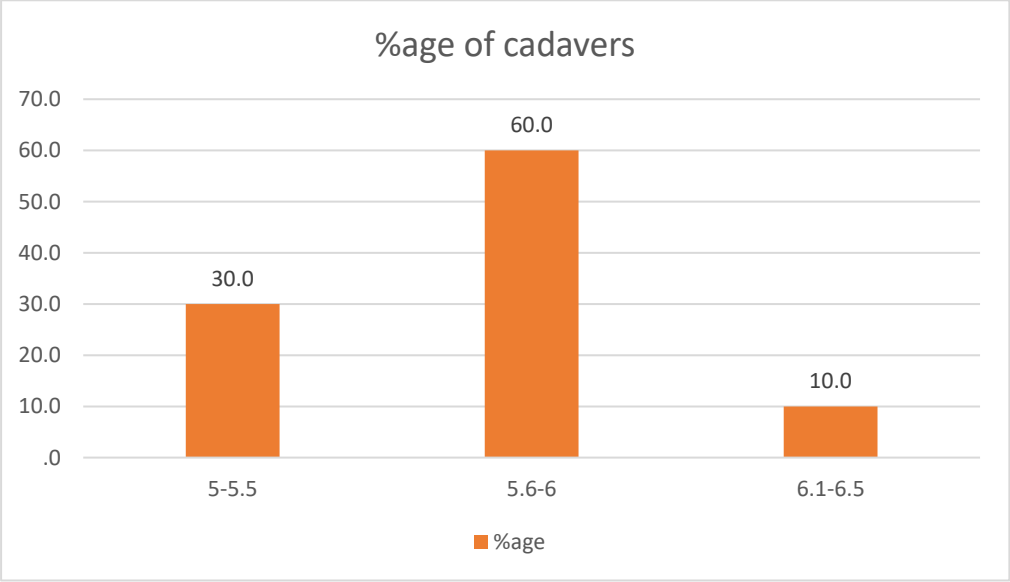
N= total no of specimen NS= nasal spine FO= frontal ostium

It was seen that frontal ostium lies at a distance of 5.6-6cm in majority of specimens 6(60%) followed by 5-5.5cm (30%)

Fig XXXV

Distance of frontal ostium from anterior nasal spine

N=10



In majority of cadavers the distance between frontal sinus ostium and nasal spine was 6 cm (60%)

Table XXXIX

Distance of middle turbinate to frontal ostium

N=10

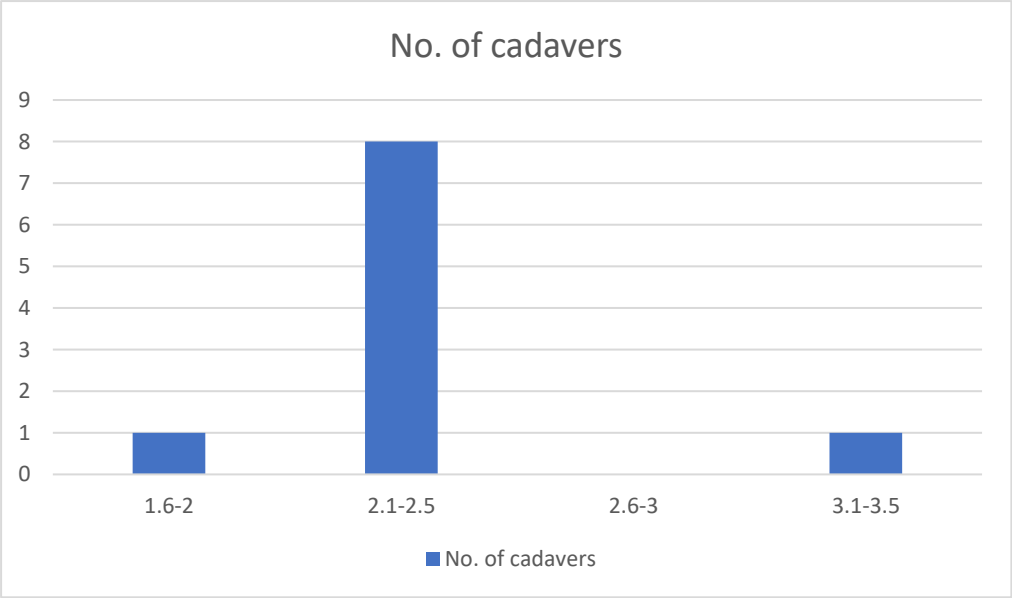
MT-FO (in cms)	No. of cadavers	%age
1.6-2	1	10.0
2.1-2.5	8	80.0
2.6-3	0	.0
3.1-3.5	1	10.0

MT=middle turbinate FO=frontal ostium

Majority of cadavers had distance of about 2.1-2.5 cm from middle turbinate to frontal ostium

Fig XXXVI

Distance of middle turbinate to frontal ostium



Majority of cadavers had distance of about 2.1-2.5 cm from middle turbinate to frontal ostium

Table XXXX

Size of frontal sinus ostium in mm

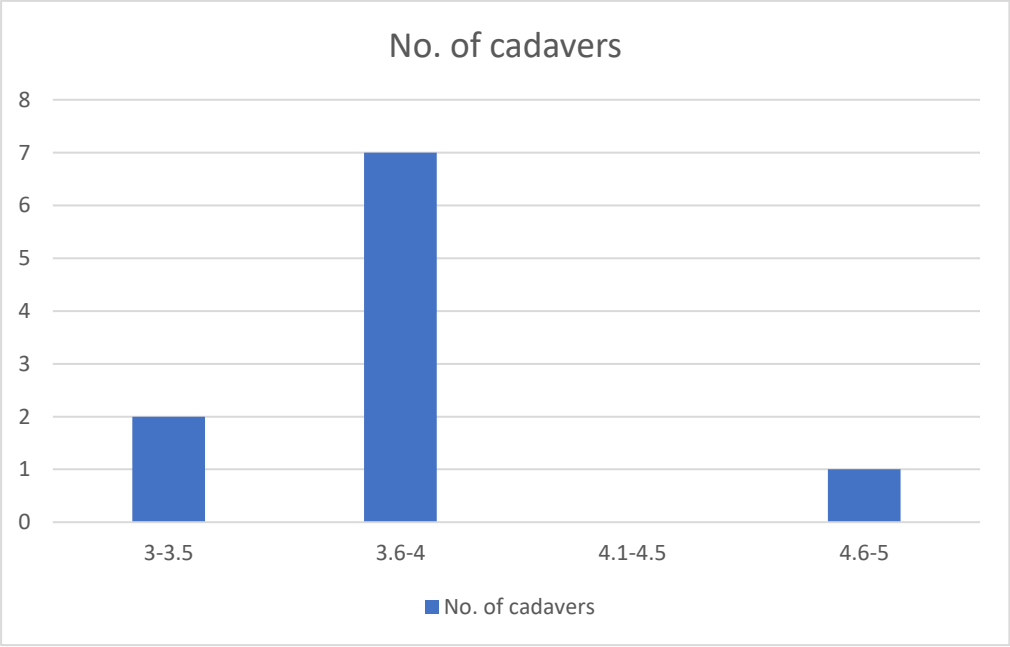
N=10

Size of Frontal Ostium (in mms)	No. of cadavers	%age
3-3.5	2	20
3.6-4	7	70.0
4.1-4.5	0	.0
4.6-5	1	10.0
Total	10	100.0

Majority of cadavers had frontal sinus ostium size between 3.6-4 mm followed by 4.6-5 mm

Fig XXXVII

Size of frontal sinus ostium in mm



Majority of cadavers have size of frontal sinus ostium of 4 mm

Table XXXXI

Presence of agger nasi cell

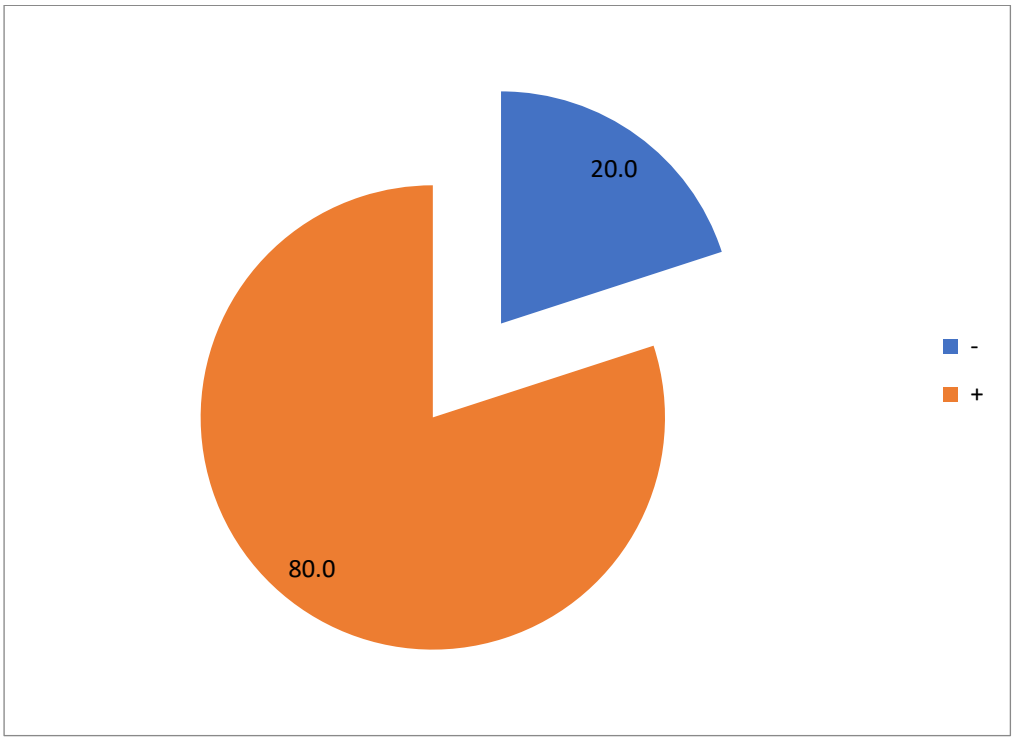
N=10

Presence of Agger nasi cell	No. of cadavers	%age
Absent	2	10.0
Present	8	80.0
Total	10	100.0

Agger nasi cell was present in 8 cadaveric specimen (80%)

Fig XXXVIII

Presence of agger nasi cell



Agger nasi cell was present in 8 cadaveric specimen (80%)

DISCUSSION

The study on access to the frontal sinus clinical and cadaveric was analysed. Comparison with available global literature was undertaken likewise on the undermentioned aspects

PART I: CLINICAL STUDY.

DEMOGRAPHIC PROFILE:

Age:

In the present study, majority of patients were in age group of 31-40 years that is 14 (23.3%) followed by 41-50 years and 51-60 years.

Youngest was 10 years of age and eldest was 85 years.

RS lebovics et Al [80]1989 conducted a study on 50 patients with frontal sinus pathology in which majority of patients were in age group more than 21 years.

Rathor et al [81] 2017 conducted a study on 34 patients in which the mean age of the patients was 33 years.

Gender:

Chen Y et al [82] 2003 studied the prevalence of chronic rhinosinusitis and its risk factors in 73,364 subjects (34,241 male and 39,123 female subjects) which was conducted from 1996 to 1997.The prevalence of rhinosinusitis was higher in female (5.7%) than in male (3.4%) subjects. The sex difference was consistent across age groups. The prevalence increased with age and levelled off after the age of 60 years.

Rathor et al[81] 2007 in his study on 34 patients found that male patients outnumbered the female patients.

In the present study, male patients 46 (77%) outnumbered the female patients 14 (23%) Either gender patients were in the age group of 10-85 years.

Socio-economic aspects:

In the present study, majority of patients 44 (73%) were from urban background and 16(27%) patients were from rural background.

Roberts et al 2007[83] studied effect of urban and rural environment on sinusitis. Urban agricultural sites had a mean frequency of 48.5%, rural agricultural sites had a mean frequency of 45.0%, in our study majority of patients were from urban background.

Bousquet et al 2005 [84] conducted a study in which majority of patients were from urban background 426 and rest were from rural background 151

Min YG, Jung et al 1996 [85] studied prevalence and risk factors of chronic sinusitis concluded that factors such as urban or rural residence, birth place, maternal and paternal age at birth, marriage, smoking history, education, social class, prior trauma, height and weight, and nasal septal deformities did not correlate with the occurrence of sinusitis.

Professional status:

In the study by Min YG Jung et al 1996[85], no correlation between occupation and prevalence of sinusitis was present.

The majority patients in the present study were businessman 18(30%)

CLINICAL PROFILE:

In the present study majority of patients presented with nasal obstruction 35 (63.3%) followed by rhinorrhoea 35 (58.3%)

Da lilly-tariah et al 2006 [86] evaluated the symptoms, signs and types of chronic rhino-sinusitis in 115 patients and concluded that rhinorrhoea 100%, blocked nose 97.4%, sneezing 67.6%, anosmia 54.8% and headache 54.8% were the common symptoms while enlarged inferior turbinates' 79.1%, anterior nasal discharge 63.5% and postnasal discharge 39.1% were the common findings on examination.

Fasunla JA, et al 2011 [87] studied Spectrum of Clinical features and management of rhinosinusitis in 228 patients concluded that five major presenting symptoms were nasal discharge 228(100.00%), nasal obstruction 224 (98.25%), frequent throat clearing189 (82.89%), itching 138 (60.53%) and excessive sneezing 136(59.65%).

Olowosusi OZ, Asoegwu [88] studied management and outcome of treatment of rhinosinusitis in 410 patients. The duration of symptoms varied from 3 days to 10 years, with 78.7% having symptoms between 3 and 120 months. About 82.4% had nasal discharge, 51.3% had sneezing, 78.9% had alternating nasal obstruction. The duration of the symptoms varied from 3 days to about 10 years.

Kristina W Rosbe et al [89] 1998 studied the signs and symptoms in 92 patients and concluded that 29(31%) patients had nasal obstruction and 18(19%) patients had post nasal drip.

In the present study, rhinorrhoea was seen in 35(58.3%). The duration of rhinorrhoea was less than 3 months in 31(51.4%) patients. Minimum duration was 1 month and maximum was 3years

In 60 patients, sneezing was present in 32 (53%) In 32 patients who had sneezing, maximum number of patients 16 (50%) had duration more than 3 months followed by less than 3 months in 15 patients (46.9 %)

Out of 60 cases, post nasal drip was seen in 34 (56.7%) Out of 34 patients who had post nasal drip, in majority (58.8%) the duration was more than 3 months.

In the present study out of 60 patients, frontal headache was seen in only 23 patients (38.3%). Out of 23 patients who had frontal headache, maximum (56.5%) had duration less than 3 months.

In the study, out of 60 patients epistaxis was seen in only 6 patients (10%). Out of 6 patients who had epistaxis, two-third had duration of less than 3 months.

In the study, nasal obstruction was seen in 38 patients (63.3%) out of total of 60 patients. Out of 38 patients in whom nasal obstruction was seen, maximum (65.5%) had duration of less than 3 months.

Associated comorbidity:

In the present study out of 60 patients, 18 patients had diabetes mellitus, 13 patients were hypertensive, 3 had tuberculosis and 7 had bronchial asthma.

M Salamah et al [90] 2020 conducted a study on 46 patients in which majority of the patients were hypertensive and only 4 patients had diabetes mellitus.

Addictions:

In the present study out of 60 patients, only 8 patients (6.7%) consumed alcohol and 4 patients (3.3%) were smokers

Chen Y et al 2003 [82] in his study concluded that cigarette smoking and low income were associated with a higher prevalence of rhinosinusitis in both sexes.

ENDOSCOPIC PROFILE:

Kristina W Rosbe et al 1998 [89] conducted a study in 92 patients and noted that purulent discharge in middle meatus as most specific sign on diagnostic nasal endoscopy in 28 patients (30%).

In the present study, out of a total of 60 patients, discharge in middle meatus was seen in 14 patients (22.5%), polyps in 19 patients (30.8%), deviated nasal septum in 16 patients (25.8%), inferior turbinate hypertrophy in 18 patients (30%).

Nass et al 1989[91] conducted a study in 218 patients and concluded that 116 patients were diagnosed with allergic rhinitis and had discharge in middle meatus and 17 patients had deviated nasal septum as mechanical obstruction.

In the present study on diagnostic nasal endoscopy discharge was seen in 16 cases in middle meatus with mucoid in majority of cases 10(37.5%).

In the study majority of cases had polyps 19 (30.8%) in nasal cavity followed by inferior turbinate hypertrophy18 (30%).

Benninger MS. Et al [92] 1998 conducted a study in 1997 in 100 patients and observed that on endoscopy polyps were present in 19 patients on diagnostic nasal endoscopy

Neena Chaudhary et al [93] 1999 conducted a study in Sixty-nine patients of Sino nasal disease not responding to conservative treatment were subjected to diagnostic endoscopy followed by functional endoscopic sinus surgery concluded that polypi was present in 19 of them.

In the present study, maximum number of patients who had discharge in nasopharynx 22(36.7%) discharge was in front of Eustachian tube, 8 patients (13.3%) had discharge behind Eustachian tube and only 2 patients (3.3%) had discharge over Eustachian tube.

M salamah et al [90] 2020 conducted a study on 390 cases of sinusitis on clinical, pathological, and imaging characteristics of allergic fungal sinusitis (AFS) and to analyse the correlation of disease duration with imaging and histopathology findings concluded that Forty-six patients were diagnosed with AFS. In medical history, noted hypertension (5, 10.9%), asthma (5, 10.9%), and diabetes (4, 8.7%), while seven (15.2%) had a history of sinus surgery. All infected sinuses presented mucosal thickening (100.0%), and variations across the given sinus were observed regarding other CT imaging findings, including increased intrasinus attenuation (88.2%-95.3%), complete opacification (74.4%-85.3%), sinus expansion (35.3%-51.2%), remodelling (20.6%-37.2%), wall thinning (41.2%-58.1%), and involvement of adjacent soft tissue, including the medial orbital wall (11.8%-25.6%)

Rathor et al 2017 [81] conducted a study in thirty-four adult patients (13 females, 21 males, mean age: 33 years). Most of the patients presented

with nasal obstruction, headache, and hyposmia. Nasal polyposis was the most common finding in CT scans, with many cases of retention cysts reported as polyps. In total, 50% of patients had a deviated septum. Concha bullosa was the most common finding among the various anatomical variations encroaching the osteomeatal complex (OMC). In our study majority cases had pansinusitis 31(51.7) followed by Sino nasal polyposis 26 (43.3%) on radiological findings

Garcia dp et al[94] 1994 conducted a study that diagnosis of chronic sinusitis dependent on the radiographic evidence by evaluating radiography of 91 patients of sinus disease concluded that 44% of patients had pansinusitis, 50% had disease involvement of at least two sinuses, and 6% had disease in a single sinus.

3) POST OPERATIVE OUTCOME:

a) Ostium diameter:

During follow-up evaluation by endoscopy at 1st month, the size of frontal sinus ostium operated by axillary flap approach is larger as compared to conventional approach with statistical difference between both the group (p value= 0.0001).

The mean value of ostia after axillary approach was 6.43 mm and via conventional was 3.33mm

During follow-up evaluation by endoscopy at 3rd month, the size of frontal sinus ostia operated by axillary flap approach is more as compared to conventional approach with statistically difference between both the group (p value= 0.0001). The mean value of ostia after axillary approach was 5.53 mm and via conventional was 2.43mm

During follow-up evaluation by endoscopy at 6th month, the size of frontal sinus ostium operated by axillary flap approach is larger as compared to conventional approach with statistical difference between both the group (p value= 0.0000). The mean value of ostia after axillary approach was 4.77 mm and via conventional was 1.80 mm.

Hence on average frontal sinus ostium in postoperative cases by axillary flap was more in comparison to conventional technique.

Seiichiro Makihara [95] 2017 performed endoscopic sinus surgery with the axillary flap approach on 38 patients (59 sides). The symptoms significantly improved after endoscopic sinus surgery. He concluded that the axillary flap technique is a safe and simple surgical procedure that provides excellent access to the frontal recess without using a 70-degree endoscope in Japanese patients. It allows clearance of cells in the recess with identification of the frontal ostium, leading to successful endoscopic sinus exploration. Moreover, it allows wide clearance of cells as most of work is done by 0-degree endoscope providing dexterity to patients as well as wide clearance of disease.

Werner et al 1997[96] conducted a study on 110 patients average diameter of frontal ostium measured intraoperatively was 5.6 mm and after complete healing post operatively was 3.5 mm using conventional frontal sinusotomy.

Jonathan et al 2014[97] conducted a study on 204 patients to determine long term patency after frontal sinus drill out procedure for treatment of advanced frontal sinus disease concluded that for majority frontal sinus outflow tract appears maintained for more than 10 years nevertheless almost 1/3of pat who underwent procedure will require additional frontal sinus surgery.

PJ Wormald [14] conducted a study in 64 consecutive patients (118 sides) undergoing axillary flap exposure of the frontal recess between November 1998 and July 1999. The frontal sinus ostium was identified in 96% of patients (104 of the 118 sides). Eight sides had Kuhn type 3 cells that required removal for clearance of the frontal ostium. Eighty-two percent of sides (97 sides) had endoscopically healed sinuses without symptoms after an average follow-up of 15.4 months. Six sides had middle meatal adhesions requiring division under local anaesthesia One patient has required revision surgery concluded that the axillary flap approach to the frontal recess provides excellent access to the frontal

recess and allows clearance of cells in the recess with identification of the frontal ostium in the vast majority of cases.

b) Edema:

During follow-up evaluation by endoscopy on 1st month, the edema in sides operated by axillary flap approach is more as compared to conventional approach but no statistical difference between both the group (p value= 0.817).

At 3rd month, edema was not found in any side so both the approaches can't be compared.

At 6th month, equal number of cases with edema, but no statistical difference between both the groups (p value= 1.000). Hence in terms of edema was more in axillary due to removal of axillary flap in comparison to conventional in which we use angled telescope but there was no statistical difference in 3rd and 6 th month.

Hiroshi M et al [98] 1994 conducted a study on endoscopic endonasal treatment of ostium of frontal sinus in 57(105 sides) patients and concluded that 77 sides (73.4%) ostium was well maintained,18 sides (17.1%) had edema in ostium though patent; in 10 sides (9.5%) ostia couldn't be confirmed due to presence of polypi.

Chandra Rk et al 2004[99] conducted a study in one hundred and eight consecutive patients who underwent frontal sinusotomy over a 2-year period from January 2000 through December 2002. Forty-two patients had follow-up less than 3 months the remaining 66 patients, representing 130 frontal sinusotomies, comprised the study group investigated herein, all patients underwent endoscopic sinus surgery (ESS) including complete (completion) ethmoidectomy and frontal sinusotomy by conventional technique after failure of medical management for chronic inflammatory disease. Ostial patency required 1) the ability to visualize the frontal sinus lumen with a 45- or 70-degree telescope, and 2) the ability to pass a 4-mm curved suction into the sinus. Ostia with edema that precluded visualization of the lumen, but did allow passage of the

suction, were considered not patent. Frontal sinus patency after 1year of frontal sinusotomy at was 82.3% (107/130), the 10 sinuses that underwent revision were associated with recurrence of frontal headache and ostial stenosis that precluded passage of a 4-mm suction. Nine of these 13 failed the criteria for patency because ostial stenosis precluded passage of a 4-mm suction. Hence edema may lead to non-passage of suction tip and in turn leading to residual symptoms but as we see oedema was present in both groups was not statistically significant.

PJ Wormald et al 2002[14] conducted a study on 64 patients and concluded that no edema was seen in 82% of sides after 15.4 months with axillary flap approach.

c) Neosteogenesis:

During follow-up evaluation by endoscopy at 1st month, 3RD month and 6-month neo-osteogenesis was not found in both the techniques.

Otto KJ 2010[100] observed osteitis and bone remodelling in subjects with chronic rhinosinusitis and suggested that the bone below Sino nasal mucosa is involved in the pathogenesis of persistent inflammation found in chronic rhinosinusitis. A total of 149 cases were analysed retrospectively for operative findings contributing to disease in the frontal sinuses. Neo osteogenesis, representing new bone formation or osteitis, was present in 19 (7%) frontal recesses. In 12 (4%) cases, the frontal recesses were found to have disease by preoperative evaluation, but on exploration, no pathology was found and an open frontal sinus ostium was noted. This is likely due to resolution of mucosal inflammation by preoperative steroid use. Despite the fact that endoscopic sinus surgery is the most commonly performed surgical procedure for the treatment of chronic rhinosinusitis and despite recent significant advancements in the imaging and instrumentation available to sinus surgeons, the frontal sinuses still represent a management The frontal sinus ostium and frontal recess in particular are prone to stenosis after surgical manipulation because of difficult anatomy and the limited dimensions of the frontal recess.

Ting ye et al in 2014[101] studied in 25 patients who underwent draf III procedure using conventional technique concluded that neoosteogenesis has significant impact on patency of frontal sinus ostium patients have higher risk can be identified preoperatively based on GOSS (GLOBAL OSTEITIS SCORING SCALE) and in patients with recalcitrant chronic rhinosinusitis pat with multiple surgeries in past leads to osteitis (64%) strongly associated with previous surgery.

PJ Wormald 2002[14] in his study on 64 patients found that no neo-osteogenesis was present in 82% of sides after 15.4 months of axillary flap approach.

d) Polypi:

During follow-up evaluation by endoscopy at 1st month, polypi noticed in sides operated by axillary flap approach were less as compared to conventional approach but no statistically difference between both the group (p value= 0.697).

At 3rd month, polypi were noticed in both the techniques but they are not statistically significant (p value=0.053).

In 6th month, more polypi were noticed in sides operated by conventional approach as compared to by axillary flap approach and is statistically significant (p value= 0.000).

Naidoo Y 2012 [102] objectives of this study were to evaluate the long-term frontal ostium patency rate and symptom improvement in patients undergoing primary endoscopic frontal sinusotomy (Draf 2A) i.e., by conventional method and to assess the impact of patient factors, disease factors, and frontal ostium size on surgical outcomes. A total of 109 patients underwent primary endoscopic surgery on 210 frontal sinuses over the study period. The overall patency rate was 92%. Complete resolution of symptoms was noted in 85 patients (78%).

Stenosis of the frontal sinus ostium correlated significantly with persistence of symptoms, infection, or polyp recurrence ($p = 0.0066$), and frontal ostium size ($p < 0.03$). this is the largest study of primary

endoscopic frontal sinus surgery in the literature concluded that frontal ostium size correlates with risk of stenosis of the frontal sinus. Patients with a stenosed frontal ostium and residual frontal sinus disease are more likely to be symptomatic or have endoscopic evidence of polyp recurrence or endoscopic evidence of persistent infection as by ostium measurement in post operative period by both techniques the mean value of ostia after axillary approach was 6.43 mm and via conventional was 3.33mm on post opt 6 th month hence axillary provide wider ostium size post operative so polypi is less frequent in comparison to conventional in which ostium diameter is less in post operative period leading to more chance of polypi formation and in turn recurrence of symptoms or residual symptoms post operatively.

Ahmed B et al[103] 2013 conducted a study in which polyps were seen in 19.8% and recurrence was more with draf 2a. So Draf 3 drillout procedure has better outcome.

PJ Wormald et al 2002[14] in his study on 64 patients using axillary flap approach found no polypi in 82% of sides after 15.4 months.

e) Webbing:

During follow-up evaluation by endoscopy at 1st month, webbing was seen in sides operated by axillary flap approach is more as compared to conventional approach but no statistical difference between both the groups (p value= 0.224).

At 3rd month, webbing was more in axillary approach than conventional approach but they are not statistically significant (p value=0.097).

At 6th month, webbing was found more in sides operated by axillary flap approach as compared to by conventional approach and is statistically significant (p value= 0.040)

As we can see we raise a mucosal flap in axillary approach the chances of webbing are more in this technique whereas in conventional we use angled telescope, webbing was more observed in axillary technique in

comparison to conventional but overall ostium diameter was more so no residual symptom was observed in axillary technique.

Vj lund et al 1998 [104] conducted a study in forty-eight mucocoeles in the frontal, fronto-ethmoidal and sphenoidal sinuses treated during the last five years, 20 by an entirely endonasal endoscopic approach and 28 by a combination of an external procedure and an endoscopic approach. There were no recurrences in the endoscopic group, with a mean follow-up of 34 months whilst three recurrences occurred in the combined external and endoscopic group which had a mean follow-up of 44 months found that webbing of the scar was present in six per cent of cases by endonasal approach.

A study by PJ Wormald et al 2002[14] on 64 patients found no webbing in 82% of sides after 15.4 months of axillary flap approach.

f) Residual symptoms:

During follow-up residual symptoms like headache and nasal blockage in sides operated by axillary flap approach are less as compared to conventional approach but there was no statistical difference between both the groups (p value= 0.496).

At 3rd month we found that residual symptoms like headache and nasal blockage in sides operated by axillary flap approach are less as compared to conventional approach but there was no statistical difference between both the groups (p value= 0.364)

At 6th month, we found that residual symptoms like headache and nasal blockage in sides operated by axillary flap approach are less as compared to conventional approach with statistically difference between both the groups (p value= 0.029)

Seth j et al 2008[105] conducted a retrospective review of patient who had frontal sinusotomy by conventional approach from Jan 1, 2001 to Jun 30, 2007 and concluded that only 17 patients had residual symptom and most common symptom being frontal headache.

PJ Wormald et al 2002[14] in his study concluded that no residual symptoms were seen in 82% of sides after 15.4 months.

In the present study as we can see if frontal ostium is patent and doesn't have polypi and has wide exposure by 0 degree endoscope with removal of residual diseased cells doesn't lead to any residual symptoms but as we see in conventional technique more recurrent polypi on follow up endoscopy, as we work by angled telescope and dexterity of that technique doesn't allow clearance of all cells and in turn leading to residual disease and ostium patency is compromised so in turn residual symptoms were more common in conventional then to axillary flap technique.

Cadaveric study

A study by Gaafar et al [77] 2001 conducted on 30 embalmed cadaver half heads found that agger nasi is present in 23 specimens of which 14 specimens with 1 cell/ specimen, 6 specimens with 2 cells/specimen, 3 specimens with 3 cells/specimen.

Ximendes et al. study 2018[78] on 13 cadavers that is 26 sides, found agger nasi cells in 23 cavities. Similarly, Orhan et al[79].2017 a Turkish study [79] of 20 cadavers, agger nasi cells were seen in 8 cadavers.

The estimation of the size of frontal ostia in cadavers was studied only by Gaafar et al 2001 [77] who found a mean ostia diameter of 5.6mm ± 0.9.

It was seen that frontal ostium lies at a distance of 5.6-6cm in majority of specimens 6(60%) followed by 5-5.5cm(30%) from anterior nasal spine.

Majority of cadavers had distance of about 2.1-2.5 cm from middle turbinate to frontal ostium.

Majority of cadavers had ostium size between 3.6-4 mm followed by 4.6-5 mm,

Agger nasi cell was present in 8 cadaveric specimen (80%).

Table: XXXXII

COMPARATIVE ANALYSIS OF VARIOUS STUDIES

Parameter	Study group	Study period	Number of subjects	Outcome
DEMOGRAPHIC PROFILE				
Age	Dmch study	2019-2021	60	Maximum in age group of 31-40 years
	Rs Lebovics et al [80]	1989	50	Age group more than 21 years
	Rathor et al[81]	2017	34	Mean age 33 years
Gender	Dmch study	2019-2021	60	23:7(male: female)
	Chen y et al[82]	2003	73364	Female>male
	Rathor et al[81]	2017	34	Males>females
Socioeconomic status	Dmch study	2019-2021	60	Urban>rural
	Roberts et al[83]	2007		Rural >urban
	Bousquet et al[84]	2005	577	Urban>rural
	Min yg Jung et al[85]	1996		No correlation between urban and rural
Occupation	Dmch study	2019-2021	60	18(30%) businessman
	Min yg Jung et al[85]	1996		No correlation between occupation and prevalence of sinusitis
Clinical profile				
Nasal obstruction	Dmch study	2019-2021	60	38(63.3.3%) had nasal obstruction with duration duration less than 3 months in most of them
	Da lilly-tariah et al [86]	2006	115	112(97.4%) had nasal obstruction
	Fasunla Ja et al[87]	2011	228	224(98.5%)had nasal obstruction
	Olowosusi et al[88]	2015	410	323(78.9%) had nasal obstruction and 323(78.7%) had duration more than 3 months
	Kristina w Rosbe et al[89]	1998	92	29 (31%) had nasal obstruction
Rhinorrhoea	Dmch study	2019-2021	60	35(58.3%) had rhinorrhoea and duration less than 3 months in most of them
	Da lilly-tariah et al[86]	2006	115	115(100%) Had rhinorrhoea

	Fasunla Ja et al[87]	2011	228	228(100%) had rhinorrhoea
	Olowosusi et al[88]	2015	410	82.4% had rhinorrhoea and majority had duration more than 3 months
Sneezing	Dmch study	2019-2021	60	32(53%) had sneezing and majority had duration of more than 3 months
	Da lilly-tariah et al[86]	2006	115	67.6% had sneezing
	Fasunla Ja et al[87]	2011	228	136(59.65%) had sneezing
	Olowosusi et al[88]	2015	410	51.3% had sneezing had duration more than 3 months
Post nasal drip	Dmch study	2019-2021	60	34(56.7%) had post nasal drip
	Da lilly-tariah et al[86]	2006	115	39.1% had post nasal drip and majority had duration more than 3 months
	Kristina w Rosbe et al[89]	1998	92	18 (19%) had post nasal drip
Frontal headache	Dmch study	2019-2021	60	23(38.3%) had frontal headache and majority had duration less than 3 months
	Da lilly-tariah et al[86]	2006	115	54.8%% had frontal headache
Epistaxis	Dmch study	2019-2021	60	6(10%) had epistaxis and majority had duration less than 3 months
				No data available
Associated comorbidity	Dmch study	2019-2021	60	18 had diabetes mellitus
	M salamah et al[90]	2020	46	4 had diabetes mellitus
Addictions	Dmch study	2019-2021	60	8 patients alcoholic and 4 patients were smoker
	Chen y et al[82]	2003		Cigarette smoking associated with high prevalence of rhinosinusitis
Endoscopic findings				
Discharge in middle meatus	Dmch study	2019-2021	60	14
	Kristina w Rosbe et al[89]	1998	92	28 (30%) had discharge in middle meatus
	Nass et al[91]	1989	218	116 had discharge in middle meatus

Mucoid discharge in middle meatus	Dmch study	2019-2021	60	10 had mucoid discharge in middle meatus
	Nass et al[91]	1989	218	116 had mucoid Discharge in middle meatus
Mucopurulent discharge in middle meatus	Dmch study	2019-2021	60	6 had mucopurulent discharge in middle meatus
	Kristina w Rosbe et al[89]	1998	92	28 (30%) had mucopurulent discharge in middle meatus
Deviated nasal septum	Dmch study	2019-2021	60	16 had deviated nasal septum
	Nass et al[91]	1989	218	17 had deviated nasal septum
Polypi	Dmch study	2019-2021	60	19 (30.8%)
	Benninger et al[92]	2007	100	19 (19%) had polypi
	Neena Chaudhary et al[93]	1999	69	27 had polypi
Discharge in nasopharynx	Dmch study	2019-2021	60	32
Discharge in nasopharynx in front of eustachian tube	Dmch study	2019-2021	60	22 (36.7%)
Discharge in nasopharynx behind eustachian tube	Dmch study	2019-2021	60	8 (13.3%)
Discharge over eustachian tube	Dmch study	2019-2021	60	2(3.3%)
				No data available
Radiological findings				
Computed tomography findings	Dmch study	2019-2021	60	Pansinusitis 31(51.7%) followed by Sino nasal polyposis 26 (43.3%)
	M salamah et al[90]	2020	46	100% had mucosal thickening in pansinuses
	Rathor et al[81]	2017	34	Sinonasal polyposis as most common computed tomography finding
	Garcia DP[94]	1994	91	44% of patients had pansinusitis
Post operative outcome				
Ostium diameter	Dmch study	2019-2021	60	The mean value of ostia after axillary approach was

				6.43 mm and via conventional was 3.33mm at 1st month. The mean value of ostia after axillary approach was 5.53 mm and via conventional was 2.43mm at 3 rd month. The mean value of ostia after axillary approach was 4.77 mm and via conventional was 1.80 mm at 6th month
	Seiichiro Makihara et al[95]	2017	38	Axillary flap approach wider access to frontal recess and in turn clearance of disease with working via 0-degree endoscope, hence dexterity to surgeon
	Werner et al [96]	1997	110	Average diameter of frontal ostium measured intraoperatively was 5.6 mm and after complete healing post operatively was 3.5 mm using conventional frontal sinusotomy
	Jonathan et al[97]	2014	208	Maximum of frontal sinus outflow tract appears maintained for more than 10 years nevertheless almost 1/3of pat who underwent procedure will require additional frontal sinus surgery
	Pj Wormald et al [14]	2002	64	82 % of sides after 15.4 months had patent frontal sinus ostium
Edema	Dmch study	2019-2021	60	Edema was more in axillary in comparison to conventional but there was no statistical difference in 3rd and 6 th month.
	Hiroshi M et al[98]	1994	57	18 sides (17.1%) had edema in ostium
	Chandra Rk et al[99]	2004	108	13 patients had edema postoperatively in conventional frontal sinusotomy

	Pj Wormald et al [14]	2002	64	No edema in 82 % of sides after 15.4 months of axillary flap approach
Neoosteogenesis	Dmch study	2019-2021	60	None have neo-osteogenesis
	Otto KJ et al[100]	2004	149	19 had neoosteogenesis by conventional technique
	Ting ye et al[101]	2014	25	Incidence of neosteogenesis is more in sinuses with previous history of sinus surgery(64%)
	Pj Wormald et al[14]	2002	64	No neoosteogenesis in 82 % of sides after 15.4 months of axillary flap approach
Polypi	Dmch study	2019-2021	60	In 6th month, more polypi were noticed in sides operated by conventional approach as compared to by axillary flap
	Naidoo y et al[102]	2012	109	Polypi in more in those who have stenosed ostium postoperatively
	Ahmed b et al[103]	2013	338	Polyp 19.8% recurrence more with draf 2 a,so draf 3 drillout procedure has more improved outcomes
	Pj Wormald et al[14]	2002	64	No polypi in 82 % of sides after 15.4 months
Webbing	Dmch study	2019-2021	60	Webbing was found more in sides operated by axillary flap approach as compared to by conventional approach
	Vj lund et al[104]	1998	20	Out of 20 operated via conventional endonasal approach webbing was seen in 6% cases
	Pj Wormald et al[14]	2002	64	No webbing in 82 % of sides after 15.4 months
Residual symptoms	Dmch study	2019-2021	60	Residual symptoms in sides operated by axillary flap approach are less as compared to conventional approach
	Seth j et al[105]	2008		17 patients had residual disease after conventional approach

	Pj Wormald et al[14]	2002	64	No residual symptoms in 82 % of sides after 15.4 months

SUMMARY & CONCLUSION

Part I CLINICAL STUDY

In comparative study of axillary flap technique with conventional technique it was seen that :-

- The frontal recess patency was retained in the axillary technique even after 6 months
- There was no effect on the incidence of allergic effect of air currents in the axillary flap technique in the form of more polypii or edema though the frontal recess is more exposed w.r.t conventional
- The post operative office debridement of frontal sinus in the axillary flap is more thorough and meticulous as compared to conventional

Part II CADAVERIC STUDY

In our study

- The frontal ostium lies was at a distance of 5.6-6cm in majority of specimens.
- Majority of cadavers had distance of about 2.1-2.5 cm from middle turbinate to frontal ostium
- Majority of cadavers had size of ostium between 3.6-4 mm
- Agger nasi cell was present in 8 cadaveric specimen i.e 80%

We suggest that the axillary flap may be adopted in primary cases and in revision cases where the frontal sinus access becomes difficult due to loss of landmarks, as it gives wide exposure to this region.

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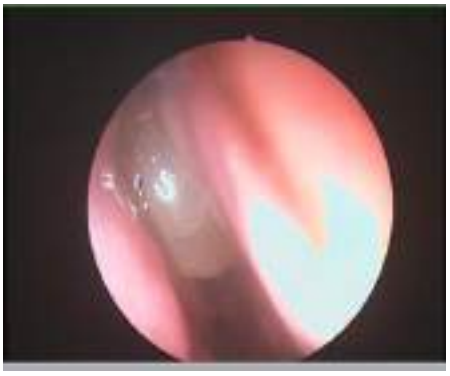
Clinical presentation

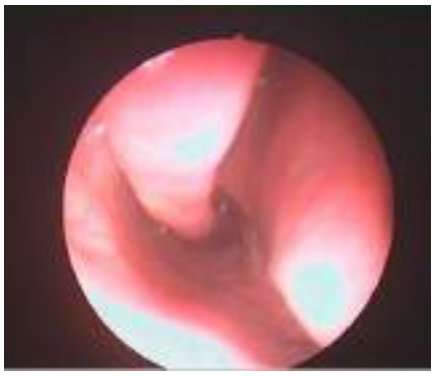
Endoscopic profile

Case I Sinonasal polyposis (left side)

Case II Discharge in nasopharynx



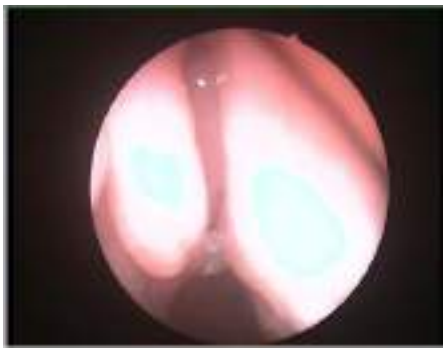
Cases III Polyp in middle meatus



Case IV Mucoid discharge in middle meatus

Case V Mucopurulent discharge in nasopharynx

Case VI Mucoid discharge in middle meatus



Case VII Mucopurulent discharge in middle meatus

Case VIII Polyp in middle meatus

Case IX Mucoid discharge in middle meatus

Case X Polyps in middle meatus

Case XI Mucopurulent discharge in nasal cavity

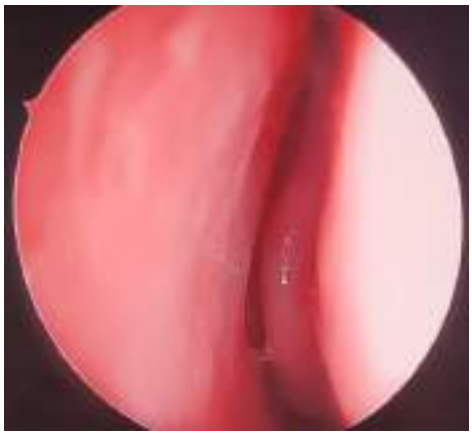
Case XII Mucoid discharge in middle meatus

Intraoperative

Steps of surgery

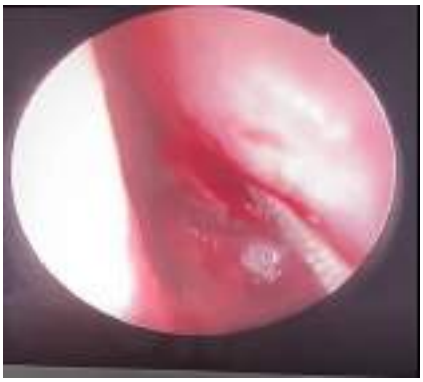
1) Axilla of middle turbinate

LEFT SIDE

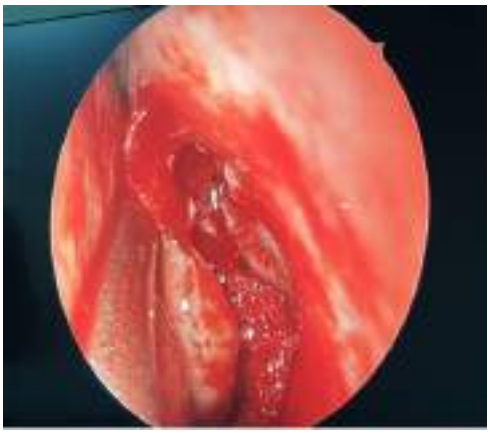


RIGHT SIDE

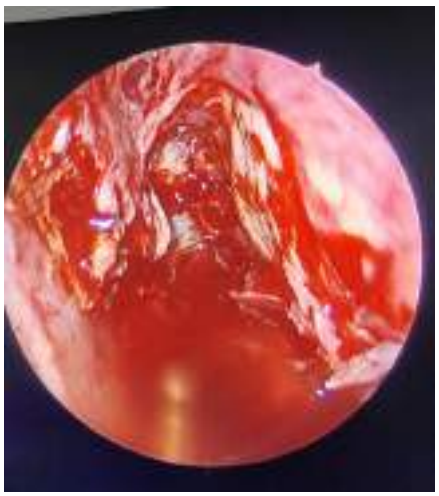
2) Raising of mucosal flap

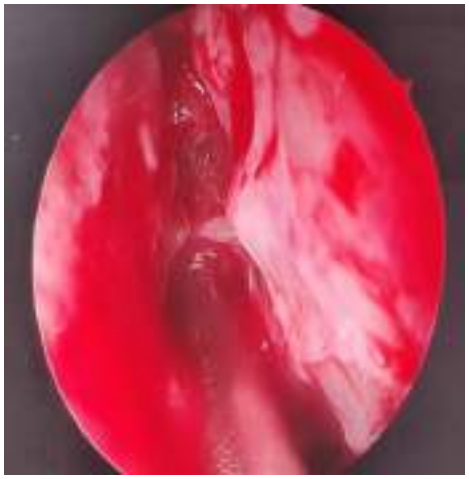


3) Parking of flap

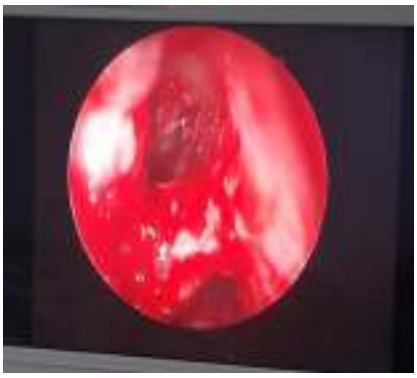


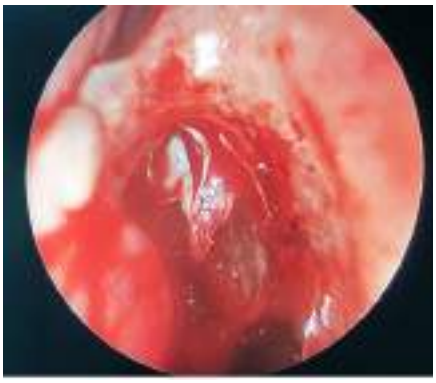
4)Removal of agger nasi cells



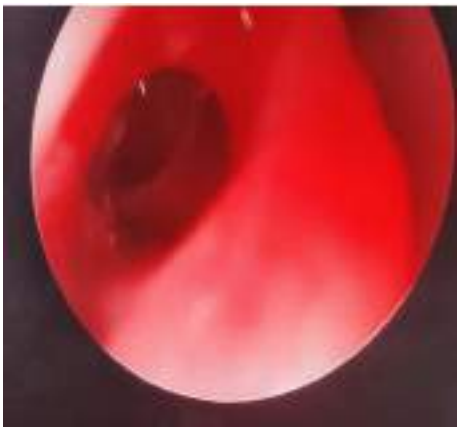


5)View of frontal sinus from 0 degree endoscope

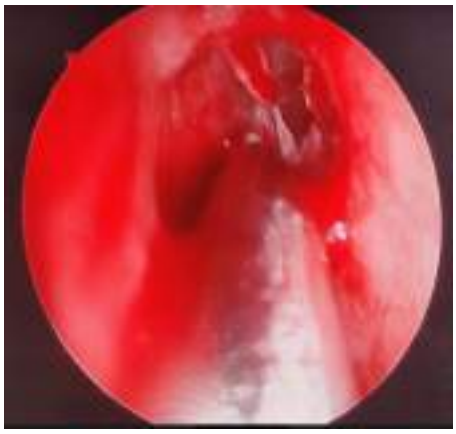


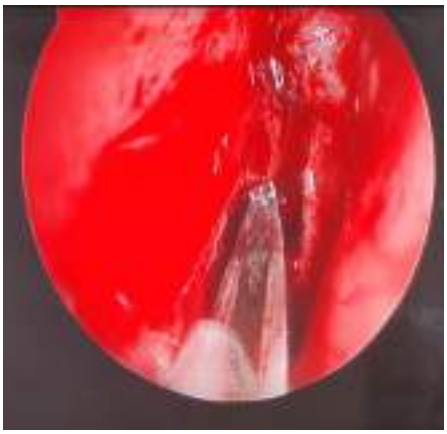


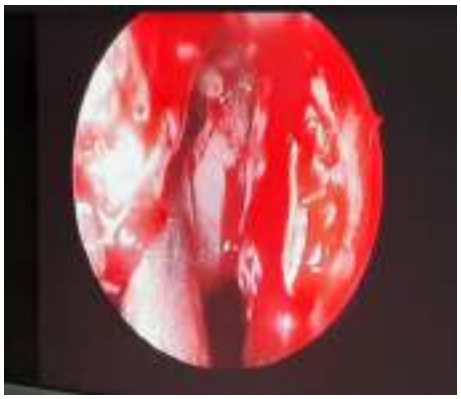
6)View from 45 degree endoscope



7) Clearance from frontal recess

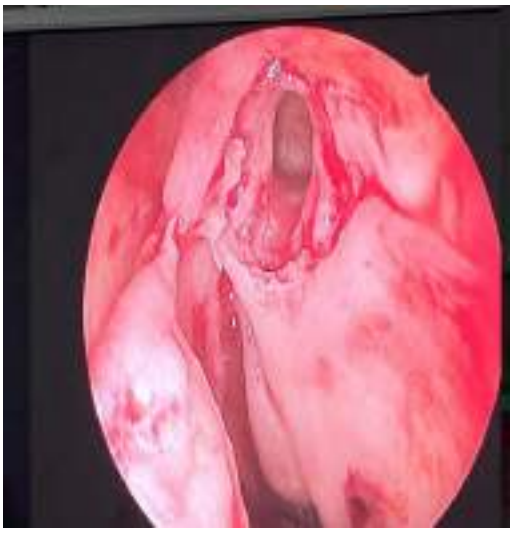
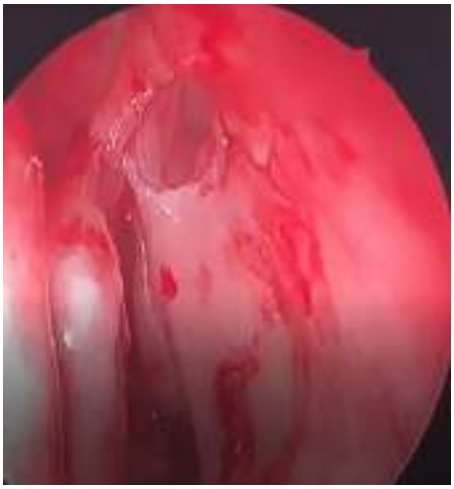






Conventional technique

Using 45 degree and 70 degree telescope

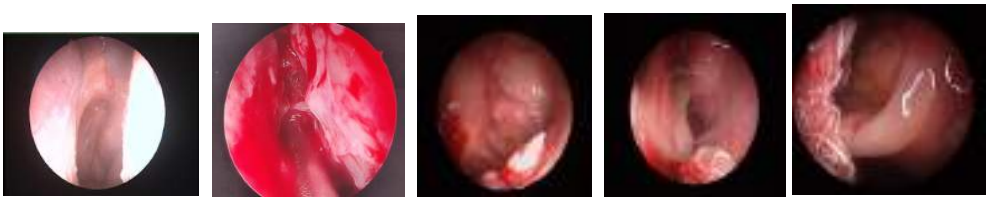



CONVENTIONAL APPROACH

Preopt Intraopt Post op 1st month 3rd month 6th month

Pt SK

Pt TK



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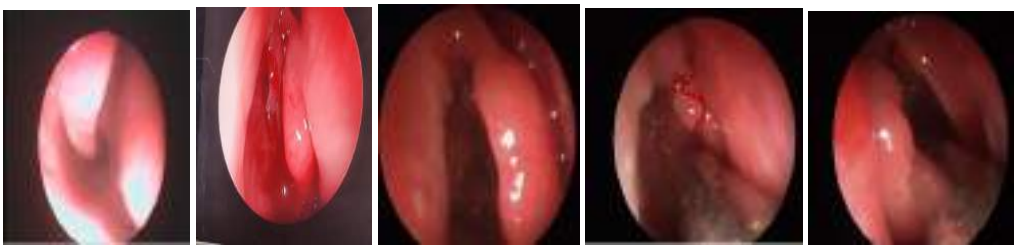

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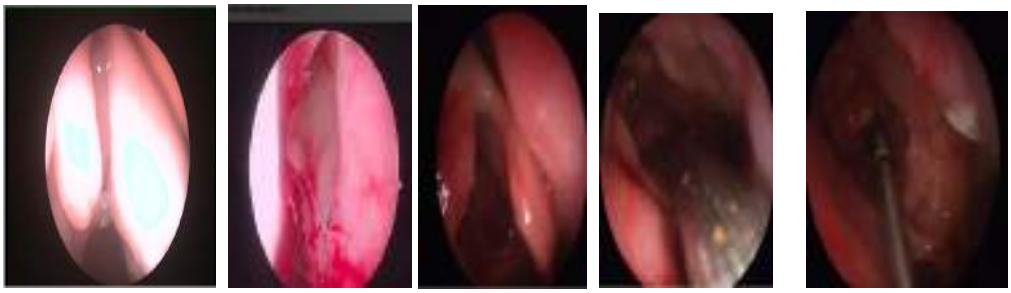

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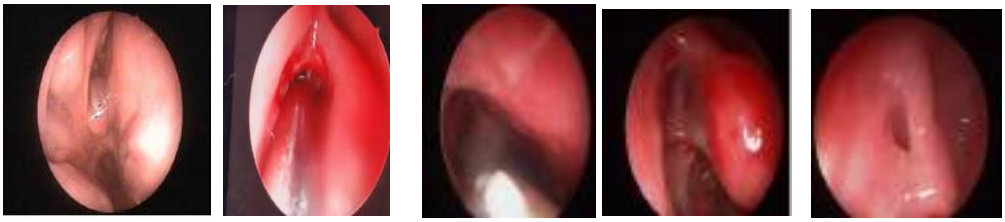
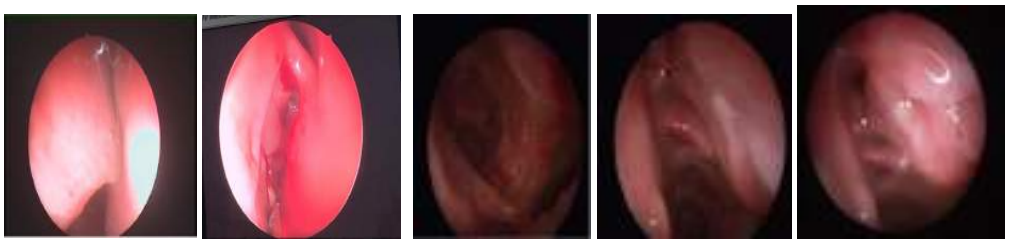


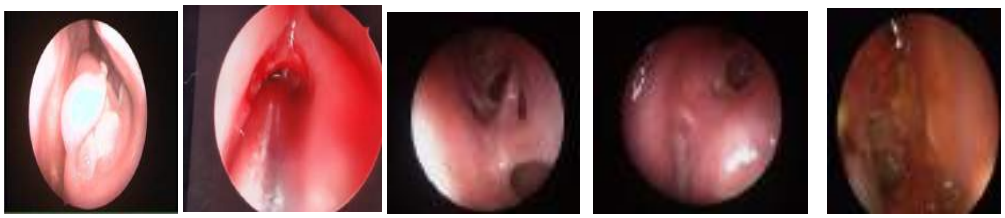
AXILLARY FLAP APPROACH

Preopt Intraopt Post op 1st month 3rd month 6th month

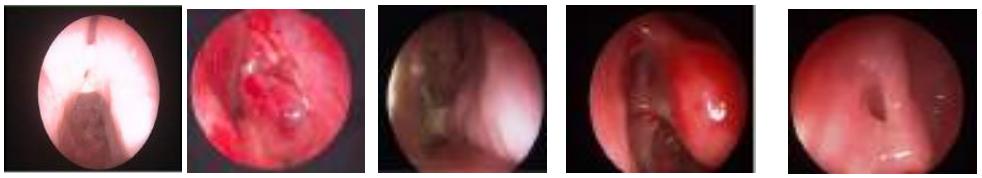
Pt SK



PT PS



Pt SJ



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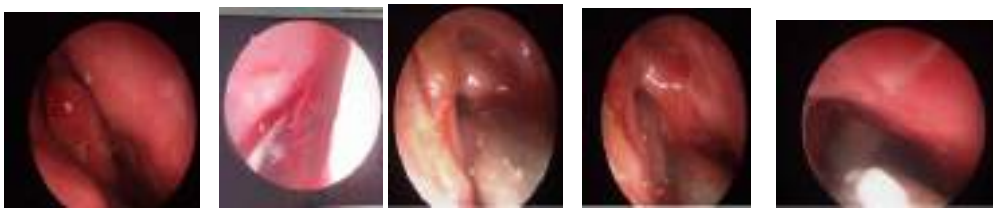

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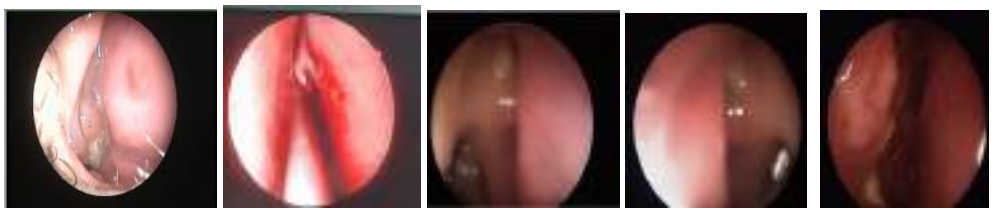
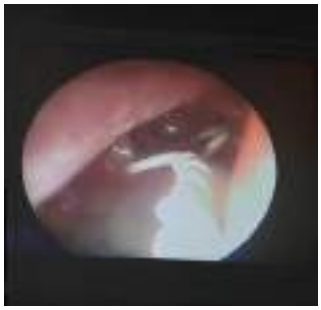
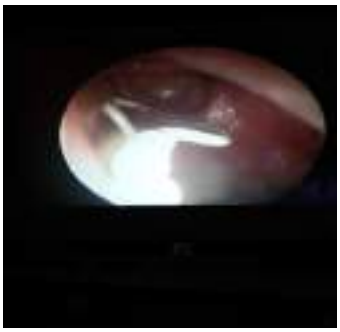
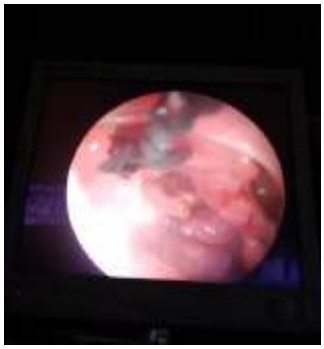
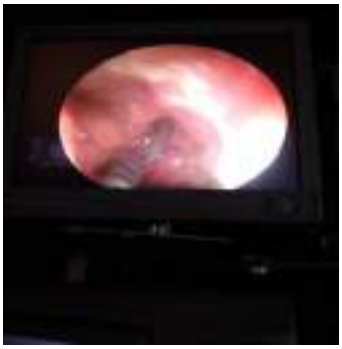


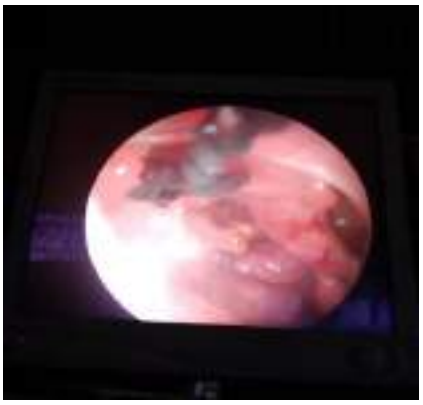
Post operative ostium measurement using wire loops

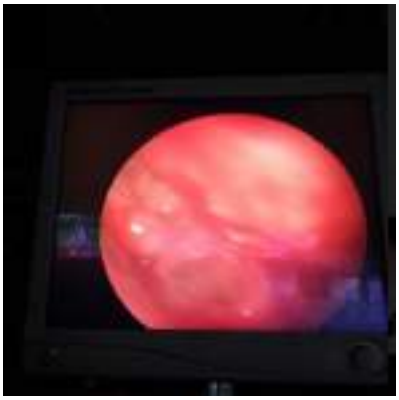


Webbing post operative

Polypi post operatively

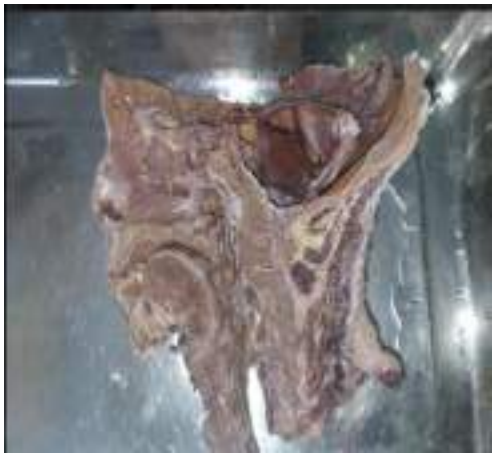




Part II Cadaveric study

Ritters suction tip in frontal sinus

Presence of agger nasi cells



Distance of frontal sinus from anterior nasal spine

Distance between frontal sinus and middle turbinate

						Address		CHIEF COMPLAINTS																PAST HISTORY					
								Rhinorrhea			Sneezing		Post Nasal drip		Frontal Headache			Epistaxis			Nasal Obstruction								
Sr. No.	MRD No	Name	Age	sex	Occupation	URBAN	RURAL	U/L	B/L	Duration	Present/ Absent	Duration	Present/ Absent	Duration	U/L	B/L	Duration	U/L	B/L	Duration	U/L	B/L	Duration	Diabetes Melitus	Hypertension	Tuberculosis	Bronchial Asthma	Treatment History	FAMILY HISTORY
1	132947	KA	16	M	STUDENT	+	-	-	+	>3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	899026	AK	37	M	BUSINESSMAN	+	-	-	-	-	+	>3	+	>3	-	+	>3	-	-	-	-	-	-	-	-	-	-	-	-
3	882203	SK	31	F	TEACHER	+	-	-	-	-	+	>3	+	<3	-	+	>3	-	+	<3	-	+	<3	-	-	-	-	-	-
4	1050392	PS	29	M	DRIVER	+	-	-	-	-	+	<3	+	>3	-	+	<3	-	-	-	-	-	-	-	-	-	-	-	-
5	1062985	SS	47	F	HOUSEWIFE	+	-	-	+	>3	+	>3	+	>3	-	+	<3	-	-	-	-	-	-	-	-	-	-	-	-
6	1052652	JS	20	M	STUDENT	+	-	-	+	<3	+	<3	+	<3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	912696	PJ	29	M	FARMER	-	+	-	+	<3	-	-	+	>3	-	+	>3	-	-	-	-	-	-	-	-	-	-	-	-
8	1014667	sA	33	F	HOUSEWIFE	-	+	-	+	<3	+	>3	+	>3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	1109834	KS	85	M	FARMER	-	+	-	+	<3	-	-	+	>3	-	+	>3	-	-	-	-	-	-	+	-	-	-	-	-
10	1019212	KK	24	F	TEACHER	-	+	-	+	<3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	1025750	MB	11	M	STUDENT	+	-	-	+	>3	+	<3	+	>3	-	-	-	-	-	-	-	+	<3	-	-	-	-	-	-
12	766266	AK	49	F	HOUSEWIFE	+	-	-	+	<3	+	<3	+	>3	-	+	<3	-	-	-	-	-	-	+	-	-	-	-	-
13	1020454	GS	65	M	FARMER	+	-	-	+	<3	+	<3	+	>3	-	+	>3	-	-	-	-	-	-	-	-	+	-	-	-
14	1072046	KS	15	M	STUDENT	+	-	-	+	<3	+	>3	+	<3	-	+	<3	-	-	-	-	-	-	-	-	-	-	-	-
15	1015661	AY	13	M	STUDENT	+	-	-	-	-	+	<3	+	>3	-	+	<3	-	-	-	-	-	-	-	-	-	-	-	-
16	11056741	JH	54	M	BUSINESS MAN	+	-	-	+	>3	+	>3	-	-	-	-	-	-	-	-	-	+	<3	-	-	-	-	-	-
17	938372	MS	39	F	HOUSEWIFE	+	-	-	+	>3	+	>3	+	>3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	441304	MB	63	F	HOUSEWIFE	-	+	-	-	-	+	>3	-	-	-	+	>3	-	-	-	-	+	<3	-	+	-	-	-	-
19	1074778	PS	15	M	STUDENT	-	+	-	+	>3	-	-	+	>3	-	+	>3	-	-	-	-	+	<3	-	-	-	-	-	-
20	1075151	RK	44	F	HOUSEWIFE	+	-	-	+	>3	+	<3	+	<3	-	-	-	-	-	-	-	+	<3	-	-	-	-	-	-
21	1011950	SJ	70	M	BUSINESS MAN	+	-	-	+	>3	-	-	-	-	-	+	<3	-	-	-	-	-	-	-	-	-	-	-	-
22	1051233	SK	41	M	FARMER	+	-	-	+	>3	+	>3	-	-	-	-	-	-	-	-	-	+	>3	-	-	-	-	-	-
23	814978	TK	28	M	STUDENT	-	+	-	+	<3	+	>3	+	>3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	1071959	JS	70	M	FARMER	-	+	-	-	-	-	-	+	<3	-	-	-	-	-	-	-	+	>3	+	+	-	-	-	-
25	991626	GJ	39	M	BUSINESSMAN	+	-	-	-	-	-	-	+	<3	-	-	-	-	-	-	-	+	<3	-	-	-	-	-	-
26	839956	GS	22	M	FARMER	+	-	-	+	<3	+	<3	+	<3	-	-	-	-	-	-	-	+	<3	-	-	-	-	-	-
27	1043113	KK	64	F	HOUSEWIFE	+	-	-	+	>3	-	-	-	-	-	+	<3	-	-	-	-	-	-	+	-	-	-	-	-
28	870214	KS	44	M	BUSINESSMAN	-	+	-	+	<3	-	-	-	-	-	+	>3	-	-	-	-	-	-	-	-	-	-	-	-
29	925661	DS	30	M	FARMER	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	>3	+	-	-	-	-	-
30	972359	MD	25	M	STUDENT	+	-	-	+	<3	+	<3	+	<3	-	-	-	-	-	-	-	+	>3	-	-	-	-	-	-
31	559644	NJ	53	M	YARN BROKER	+	-	-	+	>3	-	-	-	-	-	-	-	-	-	-	-	+	>3	+	-	-	-	-	-
32	1018478	NT	36	F	HOUSEWIFE	+	-	-	-	-	-	-	-	-	-	+	<3	-	-	-	-	+	>3	-	+	-	+	-	-
33	1006204	KS	56	M	FARMER	-	+	-	-	-	-	-	+	>3	-	-	-	-	+	>	-	+	>3	+	+	-	-	-	-
34	1078534	SK	62	F	HOUSEWIFE	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-
35	1023959	OS	59	M	BUSINESSMAN	+	-	-	+	<3	-	-	+	<3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
36	1010131	RS	42	M	ENGINEER	+	-	-	+	>3	-	-	-	-	-	-	-	-	+	>3	-	-	<3	-	+	-	-	-	-
37	571378	AK	52	M	BUSINESSMAN	+	-	-	-	-	+	>3	+	>3	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-
38	1005314	RV	16	M	STUDENT	-	+	-	-	-	+	>3	+	<3	-	-	-	-	-	-	-	+	<3	-	-	-	-	-	-
39	941335	DK	32	F	HOUSEWIFE	-	+	-	+	>3	+	>3	-	-	-	-	-	-	+	<3	-	-	-	-	-	-	-	-	-
40	1004893	NK	34	M	ENGINEER	-	+	-	+	<3	+	<3	+	<3	-	+	<3	-	-	-	-	+	<3	-	-	-	-	-	-
41	973590	PN	36	M	BUSINESSMAN	-	+	-	+	<3	-	-	+	<3	-	-	-	-	-	-	-	+	<3	+	-	-	-	-	-
42	1010131	RS	42	M	BUSINESSMAN	+	-	-	-	-	-	-	-	-	-	-	-	-	+	<3	-	+	<3	-	-	-	-	-	-
43	1002505	SK	41	M	BUSINESSMAN	+	-	-	-	-	+	<3	-	-	-	+	<3	-	-	-	-	+	<3	+	>3	-	-	-	-
44	383865	PS	42	M	BUSINESSMAN	+	-	-	-	-	-	-	-	-	-	+	<3	-	-	-	-	+	<3	-	-	+	>3	-	-
45	976538	SJ	54	M	BUSINESSMAN	+	-	-	-	-	+	=3	-	-	-	-	-	-	-	-	-	+	>3	+	>3	-	-	-	-
46	1040767	AA	45	F	HOUSEWIFE	+	-	-	+	=3	-	-	+	<3	-	-	-	-	-	-	-	+	<3	-	-	-	-	-	-
47	1024006	VA	25	M	BUSINESSMAN	+	-	-	+	<3	-	-	-	-	-	-	-	-	-	-	-	+	<3	-	-	-	-	-	-
48	876425	S	10	M	STUDENT	+	-	-	-	-	-	-	+	<3	-	-	-	-	-	-	-	+	<3	-	-	-	>3	-	-
49	1048134	SK	42	,M	FARMER	+	-	-	-	-	+	<3	-	-	-	-	-	-	-	-	-	+	<3	+	-	-	-	-	-
50	1036885	JS	62	M	FARMER	+	-	-	+	<3	-	-	-	-	-	-	-	-	-	-	-	+	<3	+	+	-	-	-	-
51	1111304	RS	56	M	BUSINESSMAN	+	-	-	-	-	+	<3	-	-	-	+	<3	-	-	-	-	+	<3	-	+	-	-	-	-
52	1111862	SK	37	M	BUSINESSMAN	-	+	-	-	-	-	-	-	-	-	+	>3	-	-	-	-	+	<3	-	-	-	+	-	-
53	1011199	TK	53	M	BUSINESSMAN	+	-	-	-	-	+	<3	-	-	-	-	-	-	-	-	-	+	<3	+	+	-	-	-	-

			PERSONAL HISTORY			GENERAL PHYSICAL EXAMINATION				LOCAL EXAMINATION															
										EAR		NOSE													
												Anterior Rhinoscopy								Posterior Rhinoscopy					
												Discharge in MM		Polyps		DNS		ITH		Discharge			Polyps	
Sr. No.	MRD No	PERSONAL HISTORY	Alcohal Consumption	Smoking	Tobacco Chewing	Pallor	Edema	Vitals	Built	Left	Right	R	L	R	L	R	L	R	L	Front	Behind	Over ET	R	L
1	132947	-	-	-	-	-	-	BP-110/90 , spo2 -98% on RA	NORMAL	TM intact	Tm intact	-	-	-	-	-	-	+	+	-	-	-	-	-
2	899026	-	-	-	-	-	-	BP-110/90 , spo2 -98% on RA	NORMAL	TM intact	TM intact	-	-	-	-	-	-	+	+	-	-	-	+	+
3	882203	-	-	-	-	+	-	BP - 110/80 , sp02 -98% on ra	NORMAL	TM intact	TM intact	+	+	+	-	-	-	+	+	-	-	-	-	-
4	1050392	-	-	-	-	-	-	bp 120/80 spo2 -98% on Ra	NORMAL	TM intact	TM intact	+	-	+	-	-	+	+	-	-	-	-	+	+
5	1062985	-	-	-	-	-	-	BP-110/90 , spo2 -98% on RA	NORMAL	TM intact	TM intact	+	+	-	-	-	-	+	+	-	-	-	-	-
6	1052652	-	-	-	-	+	-	BP 125/70mmhg hr- 72 bpm	NORMAL	TM intact	TM intact	-	-	-	-	-	-	+	+	+	-	-	-	-
7	912696	-	-	-	-	-	-	BP-110/90 , spo2 -98% on RA	NORMAL	TM intact	TM intact	-	-	+	+	-	-	+	+	-	-	+	+	-
8	1014667	-	-	-	-	-	-	BP-110/90 , spo2 -98% on RA	NORMAL	TM intact	TM intact	-	-	-	-	-	-	+	+	-	-	-	-	-
9	1109834	-	-	-	-	+	-	BP 120/80 HR-72	NORMAL	TM intact	TM intact	-	-	+	+	-	-	+	+	-	-	-	-	-
10	1019212	-	-	-	-	-	-	BP-120/70 HR-72	NORMAL	TM intact	TM intact	+	+	-	-	-	-	+	+	+	+	-	-	-
11	1025750	-	-	-	-	-	-	BP - 130/70 HR- 72BPM	NORMAL	TM intact	TM intact	-	-	+	-	+	-	-	+	+	+	-	-	-
12	766266	-	-	-	-	+	-	BP-130/80 HR-82 BPM	NORMAL	TM intact	TM intact	+	-	+	-	+	-	-	+	+	-	-	-	-
13	1020454	-	-	-	-	-	+	BP-140/80 HR 70 BPM	NORMAL	TM intact	TM intact	+	-	+	-	-	-	+	+	-	-	-	+	+
14	1072046	-	-	-	-	-	-	BP - 140/70 MMHG HR-72BPM	NORMAL	TM intact	TM intact	-	-	-	-	-	+	+	-	+	+	-	-	-
15	1015661	-	-	-	-	+	+	BP-140/80 HR 70 BPM	NORMAL	TM intact	TM intact	-	-	-	-	-	-	+	+	+	-	-	-	-
16	11056741	-	-	-	-	-	-	BP-130/80 HR-82 BPM	NORMAL	TM intact	SUBTOTAL PERFORATION	-	-	+	+	-	-	+	+	-	-	-	-	-
17	938372	-	-	-	-	-	-	BP-120/70 HR-72	NORMAL	TM intact	TM intact	+	+	+	+	+	-	-	+	-	-	-	-	-
18	441304	-	-	-	-	-	-	BP-120/70 HR-72	NORMAL	TM intact	TM intact	+	+	-	-	+	-	-	+	-	-	-	-	-
19	1074778	-	-	-	-	-	-	BP-110/90 , spo2 -98% on RA	NORMAL	TM intact	TM intact	-	-	-	-	-	+	+	-	-	-	-	+	+
20	1075151	-	-	-	-	-	-	BP-110/90 , spo2 -98% on RA	NORMAL	TM intact	TM intact	-	-	-	-	+	-	-	+	-	-	-	-	-
21	1011950	-	-	-	-	-	-	BP-120/70 HR-72	NORMAL	TM intact	SUBTOTAL PERFORATION	-	-	-	-	+	+	-	-	-	+	-	-	-
22	1051233	-	-	-	-	-	+	BP-120/70 HR-72	NORMAL	TM intact	TM intact	-	-	-	+	-	-	+	+	+	+	-	+	+
23	814978	-	-	-	-	+	-	BP-110/90 , spo2 -98% on RA	NORMAL	TM intact	TM intact	+	+	-	+	-	-	+	+	-	-	-	-	-
24	1071959	-	-	-	-	-	-	BP- 110/90, SPO2- 98% on RA	NORMAL	TM intact	TM intact	-	-	-	-	+	-	-	+	-	-	-	-	-
25	991626	-	-	-	-	-	-	BP- 120/70, SP02- 98% on RA	NORMAL	TM intact	TM intact	-	-	-	-	+	-	-	+	-	-	-	-	-
26	839956	-	-	-	-	-	-	BP 120/70, HR 72	NORMAL	TM intact	TM intact	-	-	+	-	-	-	-	-	-	-	-	-	-
27	1043113	-	-	-	-	-	-	BP- 130/90, HR- 82	NORMAL	TM intact	TM intact	-	-	-	-	-	+	+	-	-	-	-	-	-
28	870214	-	-	-	-	-	--	BP 130/70, HR 78	NORMAL	TM intact	TM intact	-	-	-	-	-	-	+	+	-	-	-	-	-
29	925661	-	-	-	-	-	-	BP- 120/70, SP02- 98% on RA	NORMAL	TM intact	TM intact	-	-	+	+	-	-	+	+	-	-	-	-	-
30	972359	-	-	-	-	-	-	BP 126/88, HR88	NORMAL	TM intact	TM intact	+	+	-	-	-	-	+	+	-	-	-	-	-
31	559644	-	-	-	-	-	-	BP 130/80, SPO2 98%	NORMAL	TM intact	TM intact	-	-	-	-	-	-	+	+	-	-	-	-	-
32	1018478	-	-	-	-	-	-	BP 120/70, HR 72	NORMAL	TM intact	TM intact	-	-	-	-	-	+	+	-	-	-	-	-	-
33	1006204	-	-	-	-	+	+	BP 140/80, HR 84, SPO2 98% RA	OBESE	TM inact	TM intact	-	-	+	+	-	-	+	+	-	-	+	-	-
34	1078534	-	-	-	-	-	-	BP 110/70, HR 70	NORMAL	TM intact	TM intact	+	+	-	-	-	-	+	+	+	-	-	-	-
35	1023959	-	-	-	-	-	-	BP 130/76, HR 84	NORMAL	TM intact	TM intact	+	+	-	-	-	-	+	+	-	-	-	-	-
36	1010131	-	-	-	-	-	-	BP 120/70, HR 72	NORMAL	TM intact	TM intact	-	-	-	+	-	-	+	+	-	-	-	-	-
37	571378	-	-	-	-	-	-	BP 130/80, SPO2 98%	NORMAL	TM intact	TM intact	-	-	-	-	-	-	+	+	-	-	-	-	-
38	1005314	-	-	-	-	-	-	BP 1220/80, HR80	N	TM intact	TM intact	-	-	+	+	-	-	+	+	-	-	-	-	-
39	941335	-	-	-	-	-	-	BP 130/70, HR 84	N	TM intact	TM intact	-	-	-	-	+	-	-	+	-	+	-	-	-
40	1004893	-	-	-	-	-	-	BP 130/80, HR80	N	TM intact	TM intact	-	-	-	-	+	-	-	+	-	-	-	-	-
41	973590	-	-	-	-	-	-	BP 140/80, HR 84, SPO2 98% RA	OBESE	TM intact	TM intact	-	-	+	+	-	-	+	+	-	+	-	-	-
42	1010131	-	-	-	-	-	-	BP 130/80, HR80	N	TM intact	TM intact	-	-	-	-	+	+	-	-	-	-	-	-	-
43	1002505	-	-	-	-	-	-	BP 1220/80, HR80	N	TM intact	AI PERFORATION	-	-	+	+	-	-	+	+	-	+	-	+	+
44	383865	-	-	-	-	+	+	BP 120/70, HR 72	N	TM intact	TM intact	+	+	-	-	-	-	+	+	+	-	-	-	-
45	976538	-	-	-	-	+	+	BP 128/78, HR 84, SPO2 96% RA	N	TM intact	TM intact	-	-	+	+	-	-	+	+	-	-	-	-	-
46	1040767	+	>3	-	-	+	-	BP 128/78, HR 90, SPO2 97% RA	N	TM intact	SUBTOTAL PERFORATION	-	-	+	+	-	-	+	+	+	-	-	-	-
47	1024006	-	>3	-	-	+	+	BP 136/80,HR72,SPO2 95%RA	OBESE	TM INTACT	TM INTACT	-	-	-	-	-	-	+	+	+	-	-	-	-
48	876425	-	-	-	-	+	-	BP 110/70, HR 70	N	TM INTACT	TM INTACT	-	-	+	+	+	-	-	+	-	-	-	-	-
49	1048134	-	-	-	-	+	+	BP 110/70, HR 70	OBESE	TM INTACT	TM INTACT	+	+	-	-	-	+	+	-	+	-	-	-	-
50	1036885	-	-	-	-	+	-	BP 140/80 HR 88 SPO2 96% RA	OBESE	TM INTACT	SUBTOTAL PERFORATION	+	+	-	-	-	-	+	+	-	-	-	-	-
51	1111304	-	-	-	-	+	-	BP 130/80 HR 85	OBESE	TM INTACT	TM INTACT	-	-	-	-	+	-	-	+	+	-	-	-	-
52	1111862	-	-	+	-	-	-	BP 130/80 HR88 SPO298% RA	NORMAL	TM INTACT	TM INTACT	-	-	-	-	+	-	-	+	+	-	-	-	-
53	1011199	-	-	-	-	-	-	BP 140/80 HR 84	NORMAL	TM INTACT	TM INTACT	-	-	+	+	-	-	+	+	+	-	-	-	-

								INVESTIGATIONS																							
								DNE																						CT/MRI	
														D/C in middle meatus				NP											
								DNS		ITH		Polyps		Mucoid		Mucopurulent		D/C				MASS IN NP	DNS		ITH				
Sr. No.	MRD No	Nasoph Mass	ORAL CAVITY	O.C.	O.P.	NECK	XRAY PNS	R	L	R	L	U/L	B/L	Rt	Lt	Rt	Lt	Front of ET	Behind ET	Over ET		R	L	R	L	Mucosal Hypertrophy	Sinonasal Polyposis		
1	132947	-	-	-	-	-	-	-	-	+	+	-	+	-	-	-	-	-	-	-	-	-	-	+	+	-	+		
2	899026	-	-	-	-	-	-	-	-	+	+	-	-	+	+	-	-	-	-	-	-	-	-	+	+	-	-		
3	882203	-	-	-	-	-	-	-	-	+	+	-	+	-	-	-	-	-	-	-	-	-	-	+	+	-	-		
4	1050392	-	-	-	-	-	-	-	+	+	-	-	-	+	+	-	-	-	-	-	-	-	+	+	-	-	+		
5	1062985	-	-	-	-	-	-	-	-	+	+	-	-	+	+	-	-	-	-	-	-	-	-	+	+	-	-		
6	1052652	-	-	-	-	-	-	-	-	+	+	-	-	-	-	+	+	-	-	-	-	-	-	+	+	-	-		
7	912696	-	-	-	-	-	-	-	-	+	+	-	+	-	-	-	-	+	-	-	-	-	-	+	+	-	+		
8	1014667	-	-	-	-	-	-	-	-	+	+	-	+	-	-	-	-	+	-	-	-	-	-	+	+	+	-		
9	1109834	-	-	-	-	-	-	-	-	+	+	-	+	-	-	-	-	-	-	-	-	-	-	+	+	-	+		
10	1019212	-	-	-	-	-	-	-	-	+	+	-	-	+	+	-	-	-	-	-	-	-	-	+	+	+	-		
11	1025750	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	+	-	-	-	+	-	-	+	+	-		
12	766266	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	-		
13	1020454	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	+		
14	1072046	-	-	-	-	-	-	-	+	+	-	-	+	-	-	-	-	+	-	-	-	-	+	+	-	+	-		
15	1015661	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	+	-	-	-	-	-	+	+	-	-		
16	11056741	-	-	-	-	-	-	-	-	+	+	-	+	-	-	-	-	-	-	-	-	-	-	+	+	-	+		
17	938372	-	-	-	-	-	-	+	-	-	+	-	-	+	+	-	-	-	-	-	-	+	-	-	+	-	+		
18	441304	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	+	-	-	-	+	-	-	+	-	-		
19	1074778	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-		
20	1075151	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	-		
21	1011950	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	+	-	-	-	+	+	-	-	-	+		
22	1051233	-	-	-	-	-	-	-	-	+	+	-	+	-	-	-	-	+	-	-	-	-	-	+	+	-	+		
23	814978	-	-	-	-	-	-	-	-	+	+	-	-	+	+	-	-	-	-	-	-	-	-	+	+	+	-		
24	1071959	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	+	-	-	-	+	-	-	+	-	-		
25	991626	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	-	-	-	-	+	-	-	+	+	-		
26	839956	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	+	+		
27	1043113	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	+		
28	870214	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	-		
29	925661	-	-	-	-	-	-	-	-	+	+	-	+	-	-	-	-	-	-	-	-	-	-	+	+	+	+		
30	972359	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	+	-	-	-	-	-	+	+	+	-		
31	559644	-	-	-	-	-	-	-	-	+	+	-	+	-	-	-	-	-	-	-	-	-	-	+	+	+	+		
32	1018478	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	+	-		
33	1006204	-	-	-	-	-	-	-	-	+	+	-	+	-	-	-	-	-	-	-	-	-	-	+	+	-	+		
34	1078534	-	-	-	-	-	-	-	-	+	+	-	-	+	+	-	-	-	-	-	-	-	-	+	+	+	-		
35	1023959	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	+	-	-	-	-	-	+	+	+	-		
36	1010131	-	-	-	-	-	-	-	-	+	+	-	+	-	-	-	-	-	-	-	-	-	-	+	+	+	+		
37	571378	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	-		
38	1005314	-	-	-	-	-	-	-	-	+	+	-	+	-	-	-	-	-	-	-	-	-	-	+	+	-	+		
39	941335	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	+	-	-	-	+	-	-	+	-	-		
40	1004893	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	-		
41	973590	-	-	-	-	-	-	-	-	+	+	-	+	-	-	-	-	-	-	-	-	-	-	+	+	-	+		
42	1010131	-	-	-	-	-	-	+	+	-	-	+	-	-	-	-	-	-	-	-	-	+	+	-	-	-	+		
43	1002505	-	-	-	-	-	-	-	-	+	+	-	+	-	-	-	-	-	-	-	-	-	-	+	+	-	+		
44	383865	-	-	-	-	-	-	-	-	+	+	-	-	-	-	+	+	+	-	-	-	-	-	+	+	-	-		
45	976538	-	-	-	-	-	-	-	-	+	+	-	+	-	-	-	-	-	-	-	-	-	-	+	+	-	+		
46	1040767	-	-	-	-	-	-	-	-	+	+	-	+	-	-	-	-	--	-	-	-	-	-	+	+	-	+		
47	1024006	-	-	-	-	-	-	-	-	+	+	-	-	-	-	+	+	-	-	-	-	-	-	+	+	+	-		
48	876425	-	-	-	-	-	-	+	-	-	+	-	+	-	-	-	-	-	-	-	-	+	-	-	+	-	+		
49	1048134	-	-	-	-	-	-	-	+	+	-	-	-	-	-	+	+	-	-	-	-	-	+	+	-	+	-		
50	1036885	-	-	-	-	-	LOSS OF SCALLOPING, FRONTAL SINUS OPACIFICATION	-	-	+	+	-	-	-	-	+	+	-	-	-	-	-	-	+	+	-	-		
51	1111304	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	-		
52	1111862	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	+	-	-	-	+	-	-	+	-	-		
53	1011199	-	-	-	-	-	-	-	-	+	+	-	+	-	-	-	-	-	-	-	-	-	-	+	+	-	+		

Sr. No.	MRD No	Pansinusitis	Mucocele	PROVISIONAL DIAGNOSIS	TREATMENT GIVEN: HISTORY OF MEDICAL MANAGEMENT	TREATMENT GIVEN: SURGICAL	SURGICAL METHOD: Right	SURGICAL METHOD: Left	FRONTAL SINUS OSTIUM MEASURMENT FOLLOW UP: 1 M R	1 M L	3M R	3M L	6M R	6M L	EDEMA: 1 M R	1 M L	3M R	3M L	6M R	6M L	NEO OSTEOGENISIS: 1 M R	1 M L	3M R	3M L	6M R	6M L	POLYPI: 1 M R	1 M L	3M R	3M L	6M R	6M L	WEBBING: 1 M R	1 M L	3M R	3M L	6M R	6M L	RESIDUAL SYMPTOMS: 1 M R	1 M L	3M R	3M L	6M R	6M L
1	132947	-	-	SINONASAL POLYPOSIS	-	-	A	C	8	4	6	2	6	0	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	+	-	-	-	-	-	-	-
2	899026	+	-	PANSINUSITIS	-	-	A	C	6	4	6	4	4	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	882203	+	-	PANSINUSITIS	-	-	A	C	6	2	4	2	0	0	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	+	-	-	-	-	-	-	+
4	1050392	-	-	SINUNASAL POLYP	-	-	A	C	6	4	6	2	4	2	+	+	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-
5	1062985	+	-	PANSINUSITIS	-	-	A	C	8	4	6	4	6	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	1052652	+	-	FRONTAL SINUSITIS	-	-	A	C	6	2	4	2	4	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-
7	912696	-	-	SINONASAL POLYPOSIS	-	-	A	C	8	2	4	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	-	-	-	-	-	-	-	-	-	-	+
8	1014667	+	-	PANSINUSITIS	-	-	A	C	6	2	6	2	4	2	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	1109834	-	-	SINONASAL POLYPOSIS	-	-	A	C	8	4	8	2	6	0	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	1019212	+	-	PANSINUSITIS	-	-	A	C	6	4	6	4	8	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-
11	1025750	+	-	FRONTAL SINUSITIS	-	-	A	C	4	4	4	2	4	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-
12	766266	+	-	PANSINUSITIS WITH DNS RIGHT SIDE WITH ITH	-	-	A	C	6	4	6	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	1020454	-	-	SINONASAL POLYPOSIS	-	-	A	C	8	2	6	2	6	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	1072046	+	-	PANSINUSITIS	-	-	A	C	4	2	4	0	4	0	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	+	-	-	-	-	-
15	1015661	+	-	PANSINUSITIS	-	-	A	C	6	2	6	2	6	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	-	+	-	-	-	-	-
16	11056741	-	-	SINONASAL POLYPOSIS	-	-	A	C	8	2	8	0	6	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	+	-	-	-	-	-
17	938372	-	-	SINONASAL POLYPOSIS	-	-	A	C	4	4	4	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	+	-	-	-	-
18	441304	+	-	PANSINUSITIS	-	-	A	C	6	4	4	2	4	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	1074778	-	-	SINONASAL POLYPOSIS	-	-	A	C	6	4	4	2	4	2	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-
20	1075151	+	-	PANSINUSITIS	-	-	A	C	8	2	6	2	6	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	1011950	-	-	SINONASAL POLYPOSIS	-	-	A	C	6	4	6	2	6	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-
22	1051233	-	-	SINONASAL POLYPOSIS	-	-	A	C	8	2	6	2	6	0	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	+	-	-	-	-
23	814978	+	-	PANSINUSITIS	-	-	A	C	6	4	6	4	4	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-
24	1071959	+	-	B/L ACUTE PAN SINUSITIS	-	-	A	C	8	4	6	4	6	2	-	-	-	-	+	-	-	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	+	-	-	-	-
25	991626	-	+	LT. FRONTAL MUCOCELE	-	-	A	C	8	4	8	4	6	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	839956	+	-	SINONASAL POLYPOSIS	-	-	A	C	4	2	4	0	4	0	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-
27	1043113	-	-	B/L FRONTAL POLYP	-	-	A	C	6	2	6	0	6	0	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-
28	870214	+	-	FRONTAL SINUSITIS	-	-	A	C	6	2	4	2	4	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	+	-	-	-	+
29	925661	-	-	SINONASAL POLYPOSIS	-	-	A	C	8	2	6	2	6	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-
30	972359	+	-	PANSINUSITIS	-	-	A	C	6	4	6	4	6	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
31	559644	-	-	SINONASAL POLYPOSIS	-	-	C	A	2	6	0	6	0	4	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	-	+	-	-	-	+	+	+	-	-	-	-	+
32	1018478	-	+	RT. FRONTAL MUCOCELE	-	-	C	A	4	6	4	6	2	4	+	+	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	+	-	-	-	+	-	-
33	1006204	-	-	SINONASAL POYPOSIS	-	-	C	A	4	8	2	6	2	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	-	-	-	-	-	-
34	1078534	+	-	MUCOSAL HYPERTROPHY IN PANSINUSES, PANSINUSITIS	-	-	C	A	4	8	2	4	2	4	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	-	+	-	-	-	-	-	-	+	-	-	-	-
35	1023959	+	-	ACUTE PANSINUSITIS	-	-	C	A	2	8	2	8	2	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	-	-	-	-	-	-	-	+	-	+	-
36	1010131	-	-	SINONASAL POLYPOSIS	-	-	C	A	4	6	2	6	2	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
37	571378	+	-	FRONTAL SINUSITIS	-	-	C	A	2	4	2	4	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	+	+	-	-	-	-	-
38	1005314	-	-	SINONASAL POLYPOSIS	-	-	C	A	4	4	4	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
39	941335	+	-	PANSINUSITIS	-	-	C	A	2	8	0	8	0	8	+	+	-	-	-	-	-	-	-	-	-	-	+	-	+	-	+	-	-	-	-	-	-	-	+	-	+	-
40	1004893	+	-	DNS RT. WITH ITH	-	-	C	A	4	6	4	6	4	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+	+	-	-	-	-
41	973590	-	-	B/L PAN SINUSESPOLYPOSIS	-	-	C	A	4	8	4	6	2	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-
42	1010131	-	-	LT. SINONASAL POLYPOSIS	-	-	C	A	6	6	4	6	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
43	1002505	+	-	PANSINUSITIS POLYPOSIS	-	-	C	A	4	6	4	6	4	4	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	+	-	-	-	-	-	+	-	-	-	+	-
44	383865	+	-	ACUTE PANSINUSITIS	-	-	C	A	2	6	0	4	0	4	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	+	+	-	-	-	-	-	-	-
45	976538	-	-	SINONASAL POLYPOSIS	-	-	C	A	4	6	2	4	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-
46	1040767	-	-	SINONASAL POLYPOSIS	-	-	C	A	6	6	6	4	4	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-
47	1024006	+	-	PANSINUSITIS	-	-	C	A	2	8	2	8	2	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	-	-	-	-	-	-
48	876425	-	-	SINONASAL POLYPOSIS WITH DNS TO RIGHT SIDE	-	-	C	A	6	8	0	6	0	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	-	-	-	-	-	+	-	+	-	+	-
49	1048134	+	-	PANSINUSITIS	-	-	C	A	2	8	2	6	2	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	-	+	-	-	-	-	-	-	-
50	1036885	+	-	PANSINUSITIS	-	-	C	A	4	4	2	4	2	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-
51	1111304	-	+	FRONTAL MUCOCELE	-	-	C	A	2	8	2	8	2	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	-	+	-	-	-	-	-	-	-
52	1111862	-	+	FRONTAL MUCOCELE	-	-	C	A	2	8	2	4	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-
53	1011199	-	-	SINONASAL POLYPOSIS	-	-	C	A	4	8	4	6	4	6	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	-	-	-

						Address		CHIEF COMPLAINTS																PAST HISTORY					
								Rhinorrhea			Sneezing		Post Nasal drip		Frontal Headache			Epistaxis			Nasal Obstruction								
Sr. No.	MRD No	Name	Age	sex	Occupation	URBAN	RURAL	U/L	B/L	Duration	Present/ Absent	Duration	Present/ Absent	Duration	U/L	B/L	Duration	U/L	B/L	Duration	U/L	B/L	Duration	Diabetes Melitus	Hypertension	Tuberculosis	Bronchial Asthma	Treatment History	FAMILY HISTORY
54	1113107	LK	31	M	STUDENT	+	-	-	-	-	+	<3	-	-	-	-	-	-	-	-	-	+	<3	-	-	+	-	-	-
55	1045661	AK	31	M	STUDENT	+	-	-	-	-	-	-	+	>3	-	-	-	-	-	-	-	+	>3	-	-	-	+	-	-
56	1104805	RK	35	F	HOUSEWIFE	+	-	-	-	-	-	-	-	-	-	+	<3	-	+	<3	-	+	<3	-	-	-	-	-	-
57	1067633	SS	59	M	BUSSINESSMAN	+	-	-	+	>3	+	>3	+	>3	-	+	>3	-	-	-	-	+	>3	+	+	-	-	-	-
58	1102701	SK	55	M	FARMER	+	-	-	+	>3	+	>3	+	>3	-	-	-	-	-	-	-	+	>3	+	-	-	+	-	-
59	1106062	RK	56	M	BUSSINESSMAN	+	-	-	+	>3	+	>3	+	>3	-	-	-	-	-	-	-	+	<3	+	+	-	+	-	-
60	1111862	SK	37	M	ENGINEER	-	+	-	+	>3	-	-	+	>3	-	-	-	-	-	-	-	+	>3	-	-	-	-	-	-

			PERSONAL HISTORY			GENERAL PHYSICAL EXAMINATION				LOCAL EXAMINATION																
										EAR		NOSE														
												Anterior Rhinoscopy								Posterior Rhinoscopy						
												Discharge in MM		Polyps		DNS		ITH		Discharge			Polyps			
																				Front	Behind					
Sr. No.	MRD No	PERSONAL HISTORY	Alcohal Consumption	Smoking	Tobacco Chewing	Pallor	Edema	Vitals	Built	Left	Right	R	L	R	L	R	L	R	L			Over ET	R	L		
54	1113107	-	-	-	-	+	-	BP 126/88, HR88	NORMAL	TM INTACT	TM INTACT	-	-	-	-	-	+	+	-	+	-	-	-	-		
55	1045661	-	-	-	-	+	+	BP 128/78 , HR 82 SPO2 96% RA	N	TM INTACT	TM INTACT	-	-	-	-	+	-	-	+	+	-	-	-	-		
56	1104805	-	-	-	-	+	-	BP 126/78 , HR 78 SPO2 98% RA	N	TM INTACT	TM INTACT	-	-	-	-	+	-	-	+	+	-	-	-	-		
57	1067633	-	-	-	-	+	-	BP 126/78	N	TM INTACT	TM INTACT	-	-	-	-	-	+	+	-	+	-	-	-	-		
58	1102701	-	+	-	-	+	+	BP 140/70 HR 72 SPO2 99% RA	N	TM INTACT	TM INTACT	-	-	-	-	-	+	+	-	+	-	-	-	-		
59	1106062	-	+	+	-	+	-	BP 128/78 HR 80	N	TM INTACT	TM INTACT	-	-	-	-	+	-	-	+	+	-	-	-	-		
60	1111862	-	-	-	-	-	-	BP 128/78 HR 72	N	TM INTACT	TM INTACT	-	-	+	+	-	-	+	+	+	-	-	-	-		

								INVESTIGATIONS																					
								DNE																				CT/MRI	
														D/C in middle meatus				NP									
								DNS		ITH		Polyps		Mucoid		Mucopurulent		D/C			MASS IN NP	DNS		ITH			
Sr. No.	MRD No	Nasoph Mass	ORAL CAVITY	O.C.	O.P.	NECK	XRAY PNS	R	L	R	L	U/L	B/L	Rt	Lt	Rt	Lt	Front of ET	Behind ET	Over ET		R	L	R	L	Mucosal Hypertrophy	Sinonasal Polyposis
54	1113107	-	-	-	-	-	LOSS OF SCALLOPING	-	+	+	-	-	-	+	+	-	-	-	-	-	-	-	+	+	-	+	-
55	1045661	-	-	-	-	-	-	+	-	-	+	-	-	+	+	-	-	-	-	-	-	+	-	-	+	-	-
56	1104805	-	-	-	-	-	-	+	-	-	+	-	+	-	-	-	-	-	-	-	-	+	-	-	+	-	+
57	1067633	-	-	-	-	-	-	-	+	+	-	-	-	-	-	+	+	+	-	-	-	-	+	+	-	+	-
58	1102701	-	-	-	-	-	-	-	+	+	-	-	+	-	-	-	-	-	-	-	-	-	+	+	-	-	+
59	1106062	-	-	-	-	-	-	+	-	-	+	-	-	+	+	-	-	+	-	-	-	+	-	-	+	+	-
60	1111862	-	-	-	-	-	-	-	-	+	+	-	+	-	-	-	-	-	-	-	-	-	-	+	+	-	+

Sr. No.	MRD No	Pansinusitis	Mucocele	PROVISIONAL DIAGNOSIS	TREATMENT GIVEN		SURGICAL METHOD		FRONTAL SINUS OSTIUM MEASURMENT FOLLOW UP						EDEMA						NEO OSTEOGENISIS						POLYPI						WEBBING						RESIDUAL SYMPTOMS					
									1 M		3M		6M		1 M		3M		6M		1 M		3M		6M		1 M		3M		6M		1 M		3M		6M		1 M		3M		6M	
					HISTORY OF MEDICAL MANAGEMENT	SURGICAL	Right	Left	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L
54	1113107	+	-	PANSINUSITIS	-	-	C	A	6	6	4	6	0	6	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	+	-	-	-	-	+	-	-	-	-	-	+	-
55	1045661	+	-	CHRONIC FRONTAL SINUSITIS	-	-	C	A	2	8	2	6	2	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
56	1104805	-	-	FRONTAL SINONASAL POLYPOSIS	-	-	C	A	4	4	4	4	4	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
57	1067633	+	-	CHRONIC FRONTAL SINUSITIS	-	-	C	A	6	2	4	2	0	2	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-
58	1102701	-	-	SINONASAL POLYPOSIS	-	-	C	A	2	8	2	8	2	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
59	1106062	+	-	PANSINUSITIS	-	-	C	A	4	6	4	6	2	4	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
60	1111862	-	-	SINONASALPOLYPOSIS	-	-	C	A	4	4	2	4	0	4	-	+	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-

CADAVERIC STUDY				
Study of Sagital Section Specimens				
Number of Specimens-10				
S.No.	NS-FO(incms)	MT-FO(incms)	Size of Frontal Ostium (inmms)	Presence of Agger nasi cell
1	6	2.5	4	+
2	5.5	2.5	4	-
3	5.5	2.5	4	+
4	6	2	4	+
5	5.5	2.5	3.2	-
6	6	2.5	4	+
7	6	2.5	4	+
8	6.5	3.5	3.2	+
9	6	2.5	5	+
10	6	2.5	4	+

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5/5/21

No. BFUHS/2K21p-TH/ 5065

Date 20/1/2021

The Principal,
DMC,Ludhiana.

Subject: Approval of Plan of Thesis.

This is to inform you that the Faculty of Medical Sciences in its meeting held on 22.01.2021 has approved the plan of thesis of **Dr. Shivam Talwar,** a student of your college for **MS Otorhinolaryngology (ENT)** along with the names of Supervisor/Co-Supervisor as under:-

Topic Plan of Thesis
Comparative analysis of axillary flap and angled conventional technique during telescopic frontal sinusotomy

Supervisor
Dr. Manish Munjal
Prof. & Head,
Dept. of ENT,
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Co-Supervisor
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Co-Supervisor
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Prof & Head,
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The student has to submit the three copies of thesis (along with PDF format) , to the Controller of Examinations, BFUHS, Faridkot, at least six months before the commencement of theory examination, if he/she is otherwise eligible to take the examination. He /She must directed to attach a photocopy of this letter with the forwarding letter while submitting thesis to the University along with the letter of approval of University for change of supervisor/Co-Supervisor, change of topic,(if any).

S P Singh

Dr. S P Singh MS(Oph)
Controller of Examinations

Note :

1. ***If any discrepancy found regarding topic of thesis or Supervisor/Co-Supervisor, inform undersigned within one month after issue of this letter.***
2. *The student may submit the thesis as per the schedule already conveyed i.e. for May/June examination 30th Nov of the preceding the year of examination and for Nov/Dec examinations 31st May of the year of examination.*

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No. 07-BFUHS/Exam/ 10191 Dated: 10/12/2020

The Principal
DMC, Ludhiana.

Subject: **Addition of Co-Supervisor.**

This is in reference to your office on the above mentioned subject. In this connection, you are informed that the Worthy Vice Chancellor has very kindly accepted your recommendations as mentioned below.

Sr.No	Name	Specialty	Already appointed Co-Supervisor	new name of Co-Supervisor
1	Dr. Shivam Talwar	MS ENT	Co-Supervisor :- Dr. Rohit Verma, Assoc.Prof, Dept of ENT Dr. Sanjeev Puri, Asstt.Prof, Dept of ENT	Co-Supervisor :- Dr. Rohit Verma, Assoc.Prof, Dept of ENT Dr. Sanjeev Puri, Asstt.Prof, Dept of ENT Dr. Hitant Vohra, Prof & Head, Dept of Anatomy.

The student may be requested to attach photocopy of this letter along with plan approval letter while submitting thesis in the university. All concerned may also be informed accordingly.

Dr. S P Singh, MS (Oph)
Controler of Examinations

All copy

COMPARATIVE ANALYSIS OF AXILLARY FLAP AND ANGLED CONVENTIONAL TECHNIQUE DURING TELESCOPIC FRONTAL SINUSOTOMY

THESIS PROPOSAL

FOR APPROVAL OF SUBJECT OF THESIS TO BE SUBMITTED IN

PARTIAL FULFILMENT OF THE REQUIREMENTS

FOR THE DEGREE OF

MASTER OF SURGERY

In

OTORHINOLARYNGOLOGY

OF THE

BABA FARID UNIVERSITY OF HEALTH SCIENCES

FARIDKOT

NOVEMBER, 2019

DR SHIVAM TALWAR

DEPARTMENT OF OTORHINOLARYNGOLOGY
DAYANAND MEDICAL COLLEGE AND HOSPITAL
LUDHIANA

ABSTRACT OF PLAN OF THESIS

Title	Comparative analysis of axillary flap and angled conventional technique during telescopic frontal sinusotomy
For the degree of	M.S. ENT
Name of the candidate	Dr. Shivam Talwar
Supervisor	Dr. Manish Munjal, Professor & Head, Department of ENT, DMCH, Ludhiana
Co-Supervisor	Dr. Rohit Verma, Associate Professor, Department of ENT, DMCH, Ludhiana Dr. Sanjeev Puri, Assistant Professor, Department of ENT, DMCH, Ludhiana
Institution	Dayanand Medical College and Hospital, Ludhiana
University	Baba Farid University of Health Sciences, Faridkot

Introduction: Frontal Sinus can be approached by conventional endoscopic frontal sinusotomy, frontal sinus osteoplastic approach, trephine+ endoscopic, intranasal modified lothtrop and axillary flap approach. In this study we will compare axillary flap with conventional endoscopic technique of frontal sinosotomy.

AIMS AND OBJECTIVES: 1) To assess long term status of frontal recess in period of 1 ½ year in the two techniques that is axillary flap and the conventional angled endoscopic technique in terms of i) Patency of frontal recess and frontal sinus ostium ii) Untoward and unexpected sequelae in frontal recess iii) any symptomatology a) frontal headache b) epistaxis c) rhinnorhoea. 2. To study the anatomy of the frontal recess in ten cadaveric specimens.

Materials and Methods: In this Study 50 cases operated with axillary flap technique will be compared with 50 cases with conventional angled technique during telescopic frontal sinosotomy

Clinical significance: This study tends to compare the efficacy of two techniques of frontal sinus approach to see in terms of Patency, untoward and unexpected sequelae in frontal recess and any symptomatology post operatively.

Keywords: Axillary Flap, Angled Conventional Telescopic Technique, Frontal Sinusotomy.

(Signature) Candidate	(Signature) Co-supervisor	Signature) Co-supervisor	(Signature) Supervisor	(Signature) Principal

CERTIFICATE OF FACILITIES AVAILABLE

This is to certify that the facilities for work on the subject of thesis titled **"COMPARATIVE ANALYSIS OF AXILLARY FLAP AND ANGLED CONVENTIONAL TECHNIQUE DURING TELESCOPIC FRONTAL SINUSOTOMY"** exist in the Department of ENT at Dayanand Medical College and Hospital, Ludhiana and will be provided to the candidate. We will see that the data being included in the thesis are genuine and is collected by the candidate herself under our supervision and guidance.

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APPROVAL PROFORMA
BY
RESEARCH & ETHICAL COMMITTEE
DAYANAND MEDICAL COLLEGE & HOSPITAL, LUDHIANA

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Department	ENT
Topic of Thesis	COMPARATIVE ANALYSIS OF AXILLARY FLAP AND ANGLED CONVENTIONAL TECHNIQUE DURING TELESCOPIC FRONTAL SINUSOTOMY
Likely date of appearing in PG examination	MAY 2022
Date of enrollment	MAY 3, 2019
Name of Head of Department	Dr. Manish Munjal
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Signature of Members of Research Committee with Stamp	**Signature of Members of Ethics Committee with Stamp**
Dr. Jaspal Singh (Professor & Head, Surgery)	Mr. A K Jindal (Member, Ethics Committee)
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BABA FARID UNIVERSITY OF HEALTH SCIENCES,

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PROFORMA FOR REGISTRATION OF SUBJECT FOR DISSERTATION

1	NAME OF THE CANDIDATE AND ADDRESS	Dr. Shivam Talwar
2	NAME OF THE INSTITUTE	Dayanand Medical College and Hospital, Ludhiana
3	COURSE OF STUDY AND SUBJECT	MS ENT
4	DATE OF ADMISSION OF COURSE	03-05-2019
5	TITLE OF THE TOPIC	Comparative analysis of axillary flap and angled conventional technique during telescopic frontal sinusotomy

6. BRIEF RESUME OF THE INTENDED WORK

6.1 NEED FOR THE STUDY

The paranasal sinuses are air-filled cavities located within the bony framework of the skull and the face. They are centered on the nasal cavity and have varied functions, namely lightening the skull, humidifying and warming the inhaled air, adding resonance to speech, and serving as a "crumple" zone to protect vital structures in the unfortunate event of maxillofacial trauma. Four pair of sinuses are recognized namely maxillary, ethmoid, frontal and the sphenoid,

The frontal sinuses [1] are the superiorly located in the anterior group of sinuses and found under the forehead. These are variable in size, but always triangular in shape .They drain into the nasal cavity through the frontonasal duct, which opens in hiatus semilunaris on the lateral wall at inferior meatus.

The frontal recess refers to the narrowest anterior air channel also called "pre chamber".[2,3] This communicates with the frontal sinus. It is a common site of inflammation. The walls of the recess are constituted by the agger nasi cells anteriorly, the lamina papyracea laterally, and the middle turbinate medially. This recess opens into the middle meatus in 62% of subjects and into the ethmoidal infundibulum in rest of the cases.[4] On coronal computed tomography scan, this recess is identified superior to the agger nasi cells.

The osteoplastic flap has historically been the mainstay of surgical access to the frontal sinus, but with the advancement of the endoscopic intervention, its has become near obsolete. However, accessing the frontal sinus provides a greater surgical challenge, than the other sinuses owing to the anatomical constraints present in an endoscopic approach. In this respect, navigating the frontal recess and sinus with its variable array of cells from the agger nasi to the intersinus septal and frontal cells, means that any access to this area endoscopically must have sufficient dextrity as well as suitable instrumentation.

Ventilation and mucociliary clearance of the frontal sinuses require a wide and patent frontal recess as well as the frontal ostium. The

approach to frontal sinus can be by conventional, external and internal approaches or purely internal endoscopic [5] Navigation even facilitates frontal sinus access

Messerklinger [6] developed the endoscopic technique with the aim to rejuvenate the diseased sinuses while preserving healthy mucosa, with a minimally invasive modality. Whilst the technique has previously been advocated, other endoscopic techniques have gained recent popularity, namely the modified Lothrop that is frontal sinus drill out and the balloon sinuplasty. Combined intranasal and external approaches to the frontal sinus are other available options, i.e trephination and osteoplastic flaps with or without sinusobliteration.[7]

The axillary flap technique as advocated by PJ Wormald 2002 [8,9] is a recent modality where frontal recess is approached with 0 degree rather than angled telescope. The exposure obtained intraoperatively and the long term patency of frontal recess in either technique will be compared in this study of 30 patients operated with axillary flap technique and 30 cases with conventional angled telescopic technique.

6.2 REVIEW OF LITERATURE

The aim of operating in the frontal recess is to treat the existing disease from an anatomical perspective and relieve obstruction of the outflow tract and also, to prevent recurrence. Mucociliary clearance in the frontal sinus occurs in a counterclockwise direction in the right sinus and in a clockwise direction in the left. Secretions are transported along the septal wall to the sinus roof and from there, laterally along the roof and then medially along the floor to reach the ostium. Secretions that are retained because of obstruction serve as a nidus and as growth media for infections [10] Unfortunately, iatrogenic causes have a large part to play in recurrent frontal sinusitis, namely osteoneogenesis and recurrent polyposis

The frontal sinus interventions can be broadly divided into 2 categories

1)External procedures:

- Osteoplastic flap with/without obliteration
- Frontal sinus trephine
- Frontal sinus cranialization
- Combined above and below approaches (external plus endoscopic).

2)Transnasal endoscopic procedures

- Endoscopic frontal sinusotomy
- Modified endoscopic Lothrop procedure (MEL)

THE OSTEOPLASTIC FLAP

Osteoplastic flap with obliteration is indicated in chronic frontal sinusitis refractory to endoscopic surgery, mucopyocele, severe trauma with fractures involving the drainage pathways, and after resection of large frontal tumors near the frontal recess. The frontal sinus outline is marked using a template of "Caldwell" radiograph. Osteotomies are performed and the sinus is opened. The mucosa of the sinus is completely removed and the frontal recess is occluded with an autologous fat graft and soft tissue and finally the bony flap is replaced. The postoperative CT and MR appearances of this procedure are highly variable due to the spectrum of tissues that may be present within the sinus. Tissues may include fat, chronic inflammatory changes, retained secretions, granulation tissue, and fibrosis. MR may

be of limited utility in distinguishing symptomatic patients with recurrent disease from asymptomatic patients with imaging findings related to scar.[11]

Joshua et al 2006 studied the indications for osteoplastic frontal sinus obliteration (OFSO) concluded that osteoplastic frontal sinus obliteration remains a valuable surgical technique in the treatment of inflammatory sinus disease. OFSO should be included in the preoperative counseling of patients with frontal sinus disease.[12]

ENDOSCOPY FRONTAL SINUSOTOMY

A 70° endoscope assisted access with 45 and 90 degree angled instruments namely the through-cut, frontal sinus seekers, frontal sinus giraffe forceps, suction curettes and the mushroom punches.[13]

Endoscopic frontal recess approach (DRAF TYPE I)

The endoscopic frontal recess approach (Draf type I) procedure is indicated when frontal sinus disease persists despite more conservative endoscopic approaches directed at the infundibulum and anterior ethmoid region. This procedure involves complete removal of the anterior ethmoid cells and uncinate process surrounding the frontal recess to the frontal ostium. Obstructing frontal cells, if present, are removed. The frontal sinus ostium may then drain into a patent frontal recess.

BALLOON SINUPLASTY

Balloon sinuplasty is a recent technique performed endoscopically for maxillary and frontal sinus ostia. Although the long-term results are not yet forthcoming, the immediate results are good with minimally invasive technique, in the properly selected patient. This technique can be undertaken as an outpatient procedure or as part of a formal procedure under general anaesthesia. Balloon sinuplasty may not be appropriate for all chronic and recurrent sinusitis patients. Clinical studies have typically excluded patients with:

- Eosinophilic disease
- Severe polyposis or fungal sinusitis
- Severe septal deviation
- Cystic fibrosis

- *Samter's triad*
- Facial trauma [14]

EXTENDED ENDOSCOPIC APPROACH [15]

The Draf III or Modified Lothrop procedure commonly known as the "frontal sinus drill out" is promoted by select centres. In this technique the floors of the frontal sinuses as well as the intersinus septum and the upper septal cartilage beneath that, are removed, therebycreating a *common median drainage pathway. This procedure involves removal* of the inferior portion of the interfrontal septum, the superior part of the nasal septum, and the frontal sinus floor to the orbit laterally. The lamina papyracea and posterior walls of the frontal sinus remain intact. Postoperatively, a wide opening into both frontal sinuses can be seen. The surgical defect in the superior nasal septum should not be mistaken for an unintended postoperative septal perforation.

AXILLARY FLAP TECHNIQUE

Wormald PJ et al 2002 conducted a study evaluated the access to the frontal recess using the axillary flap approach by identifying the frontal ostium during endoscopic sinus surgery in 64 patients. It emphasized that the axillary flap approach to the frontal recess provides excellent access to the frontal recess and allows clearance of cells in the recess with identification of the frontal ostium in the vast majority of cases. The axillary flap approach will give a better access to the frontal **recess area and based on the** dissection on the close relationship of the agger nasi with the frontal recess. The anterior wall of the agger nasi is **removed following the elevation** of the axillary flap. The frontal recess dissection is carried out systematically depending on the CT information and preoperative planning, removing the bulla and the surrounding cells to open the frontal recess as wide as possible.[8,9]

Ulualp et all 2000[16], concluded that osteoplastic flap with fat obliteration is more superior that endoscopic Lothtrop in patients with chronic frontal sinusitis but follow up in from 6 months to 2.5 yr in Lothtrop but in osteoplastic flap is much smaller.

Nathan b sautter et all 2007[17] conducted study is to evaluate the efficacy of the minimally invasive endoscopic approach for

resection of frontal recess/sinus inverted papilloma and concluded that the minimally invasive endoscopic approach is effective for successful resection of frontal recess/sinus inverted papilloma. Adjunctive open approaches or extended frontal drill-out approaches may be required to achieve complete tumor removal and he also studied precise manner in which balloon catheter dilatation alters dimension of frontal recess and frontal sinus outflow tract and concluded that saggital and coronal dimension of frontal sinus outflow tract increase significantly after balloon catheter dilatation and draff II disssection, more changes in draff iiithen balloon catheter dilatation.[18]

Sameh M amin et al 2017[19] conducted a study on endoscopic external frontal sinus obliteration which confined to small-sized and medium-sized pneumatized frontal sinuses aim was to assess the feasibility and surgical application of this technique for far-lateral pneumatized frontal sinuses He concluded that the external endoscopic multiportal frontal sinus obliteration is feasible for far-lateral pneumatized frontal sinuses. The technique is minimally invasive, with minimal complications and achieved successful frontal sinus obliteration over short-term follow-up.

6.3 AIMS AND OBJECTIVES OF THE STUDY

1. To assess long term status of frontal recess in period of 1 ½ year in the two endoscopic techniques that is axillary flap and the conventional angled technique in terms of
    1) Patency of frontal recess and frontal sinus ostium
    2) Untoward and unexpected sequelae in frontal recess
    3) any symptomatology

2. To study the anatomy of the frontal recess in ten cadaveric specimens.

7. MATERIALS AND METHODS

7.1 Source of Data

In this Study 50 cases operated with axillary flap technique will be compared with 50 cases with conventional angled technique during frontal sinosotomy.

7.2 METHOD OF COLLECTION OF DATA

INCLUSION CRITERIA

Frontal sinus pathology

1) Sinusitis
   - acute
   - chronic
2) Sinonasal polyposis
3) Mucoceles

EXCLUSION CRITERIA

Revision cases of frontal sinus surgery will not be included

No. of Patients

Total no. of patients 50 will be enrolled in the study.

STATISTICAL ANALYSIS

Data will be described in terms of range, mean±standard deviation (±SD), frequencies (No of cases) and relative frequencies (%age) as appropriate.

OUTCOME

Evaluation of frontal recess in axillary flap & conventional technique during telescopic frontal sinusotomy by DNE at 1 month,3 month and 6 months to visualize ostium for 1) webbing

- Membranous web
- Fibrous web

2) edema

3)neoosteogenesis

4)polypi

and to measure frontal ostium using indigenously designed wire loops

7.3 DOES THE STUDY REQUIRE ANY INVESTIGATIONS OR INTERVENTIONS TO BE CONDUCTED ON PATIENTS OR OTHER HUMANS OR ANIMALS? IF SO, PLEASE DESCRIBE BRIEFLY.

Yes INVESTIGATIONS TO BE CONDUCTED IN PATIENTS –

1. Clinical examination: General physical examination, ENT examination
2. Endoscopy: Diagnostic nasal endoscopy will be done.
3. Radiological assessment: magnetic resonance imaging / computed tomography.

7.4 HAS ETHICAL CLEARANCE BEEN OBTAINED FROM YOUR INSTITUTION IN CASE OF 7.3?

Attached herewith

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PERFORMA

IDENITIFICATION DATA

Name SERIAL NO.

C.R. No.

Age / Gender:

Occupation

Address

CHIEF COMPLAINTS **DURATION**

Rhinorrhoea

Sneezing

Post nasal drip

Frontal Headache

Epistaxis

Nasal obstruction

PAST HISTORY **DURATION**

Diabetes mellitus

Hypertension

Tuberculosis

Bronchial asthma

Treatment history

FAMILY HISTORY

PERSONAL HISTORY **DURATION**

Alcohol Consumption

Smoking

Tobacco chewing

Signature of Supervisor

Signature of Candidate

GENERAL PHYSICAL EXAMINATION

Pallor

Edema

Vitals

Built

LOCAL EXAMINATION

Ear Left

Right

Nose Anterior Rhinoscopy

Posterior Rhinoscopy

Oral cavity

O.C

O.P

Indirect Laryngoscopy:

Neck

MANAGEMENT

INVESTIGATIONS

1 XRAY PNS(/ _/_____) Caldwell's view

2 DNE(_____/_/_____)

2. CT/ MRI Finding (____/_/____)

PROVISIONAL DIAGNOSIS:

Signature of Supervisor Signature of Candidate

TREATMENT GIVEN:

SURGICAL METHOD:-

FRONTAL SINUS OSTIUM MEASUREMENT(POST SURGERY)

FOLLOW UP ENDOSCOPY

Signature of Supervisor

Signature of Candidate

INFORMED PATIENT CONSENT

Date: _____

I.....D/o, W/o, S/o.....
am willing to participate in the study **"COMPARATIVE ANALYSIS OF AXILLARY FLAP AND ANGLED CONVENTIONAL TECHNIQUE DURING TELESCOPIC FRONTAL SINUSOTOMY"** The procedure with its complications has been explained to me in local vernacular language. I have fully understood that no special tests and extra expenditure in any form, merely for the purpose of thesis is being carried out. I am free to opt out the study any time without assigning any reason.

.....
Signature of the Witness

.....
Signature of the patient

Name:

Signature of Candidate

Signature of Supervisor

मरीज अनुमति फार्म

तिथि _____

मैं _____ पत्नी/पुत्र/पुत्री _____

निवासी _____

इस शोधकार्य ""**COMPARATIVE ANALYSIS OF AXILLARY FLAP AND ANGLED CONVENTIONAL TECHNIQUE DURING TELESCOPIC FRONTAL SINUSOTOMY**" में भाग लेने के लिए सहमत हूँ। मैं इस शोधकार्य में भाग लेने के लिए अपनी स्वेच्छा से तैयार हूँ। मैं पुष्टि करता/करती हूँ की यह स्वीकृति देने के लिए मुझे कोई आर्थिक प्रलोभन नहीं दिया गया और न ही दबाव डाला गया है। मुझे इस शोधकार्य का उद्देश्य स्पष्ट कर दिया गया है और मुझे यह विश्वास है की यह विज्ञान और मानवता के लाभ के लिए है। मुझे इस शोधकार्य में होने वाले जोखिम के बारे में समझा दिया गया है और मेरी समझ में यह जोखिम बहुत मामुली है।

मैं इस शोधकार्य में भाग लेने के सम्बन्ध में किसी भी समय अपनी अस्वीकृति व्यक्त कर सकता/सकती हूँ और मेरे अस्वीकृति व्यक्त करने का मेरे इलाज पर कोई प्रभाव नहीं पड़ेगा।

_____ _____

गवाह के हस्ताक्षर रोगी के हस्ताक्षर/अंगूठे का निशान

नाम: नाम:

_____

अन्वेषक के हस्ताक्षर

_____

विद्यार्थी के हस्ताक्षर

ਮਰੀਜ਼ ਰਜ਼ਾਮੰਦੀ ਫਾਰਮ

ਮਿਤੀ_____

ਮੈ_____ਪਤਨੀ/ਪੁੱਤਰ/ਪੁੱਤਰੀ_____

ਵਾਸੀ _____

"COMPARATIVE ANALYSIS OF AXILLARY FLAP AND ANGLED CONVENTIONAL TECHNIQUE DURING TELESCOPIC FRONTAL SINUSOTOMY" ਤੇ ਚਲ ਰਹੀ ਖੋਜ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਲਈ ਰਜ਼ਾਮੰਦ ਹਾਂ। ਇਸ ਖੋਜ ਕੰਮ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਲਈ ਮੈ ਆਪਣੀ ਮਰਜ਼ੀ ਨਾਲ ਤਿਆਰ ਹਾਂ। ਮੈ ਇਹ ਦਸਣਾ ਚਾਹੁੰਦਾ ਹਾਂ/ ਚਾਹੁੰਦੀ ਹਾਂ ਕੇ ਇਹ ਰਜ਼ਾਮੰਦੀ ਦੇਣ ਵਾਸਤੇ ਮੈਨੂ ਕਿਸੇ ਵੀ ਤਰਾਂ ਦਾ ਲੋਭ-ਲਾਲਚ ਨਹੀ ਦਿੱਤਾ ਗਿਆ ਅਤੇ ਨਾ ਹੀ ਕੋਈ ਦਬਾ ਪਾਇਆ ਗਿਆ ਹੈ। ਮੈਨੂ ਇਸ ਖੋਜ ਦਾ ਮਨੋਰਥ ਸਮਝਾ ਦਿੱਤਾ ਗਿਆ ਹੈ ਅਤੇ ਮੈਨੂ ਇਹ ਭਰੋਸਾ ਦਵਾਇਆ ਗਿਆ ਹੈ ਕੇ ਇਹ ਖੋਜ ਵਿਗਿਆਨ ਅਤੇ ਮਾਨਵਤਾ ਦੀ ਭਲਾਈ ਲਈ ਹੈ। ਮੈਨੂ ਇਸ ਖੋਜ ਵਿਚ ਹੋਣ ਵਾਲੇ ਖਤਰੇ ਬਾਰੇ ਸਮਝਾ ਦਿੱਤਾ ਗਿਆ ਹੈ ਅਤੇ ਮੈਨੂ ਇਹ ਯਕੀਨ ਹੈ ਕੇ ਇਹ ਖਤਰਾ ਬਹੁਤ ਮਾਮੂਲੀ ਹੈ। ਮੈਨੂ ਇਸ ਖੋਜ ਕੰਮ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਦਾ ਢੰਗ – ਤਰੀਕਾ ਸਮਝਾ ਦਿੱਤਾ ਗਿਆ ਹੈ।

ਮੈ ਇਸ ਖੋਜ ਕੰਮ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਬਾਰੇ ਆਪਣੀ ਰਜ਼ਾਮੰਦੀ ਕਿਸੇ ਵੀ ਸਮੇ ਵਾਪਸ ਲੈ ਸਕਦਾ ਹਾਂ/ ਸਕਦੀ ਹਾਂ ਅਤੇ ਮੇਰੀ ਰਜ਼ਾਮੰਦੀ ਵਾਪਸ ਲੈਣ ਦਾ ਮੇਰੇ ਇਲਾਜ ਤੇ ਕੋਈ ਅਸਰ ਨਹੀ ਹੋਵੇਗਾ।

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ਗਵਾਹ ਦੇ ਹਸਤਾਖਰ

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ਮਰੀਜ਼ ਦੇ ਹਸਤਾਖਰ

ਮਿਤੀ_____

ਮਿਤੀ_____

ਪਤਾ _____

ਪਤਾ _____

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ਨਿਰੀਖਕ ਦੇ ਹਸਤਾਖਰ

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ਸਿਖਿਆਰਥੀ ਦੇ ਹਸਤਾਖਰ